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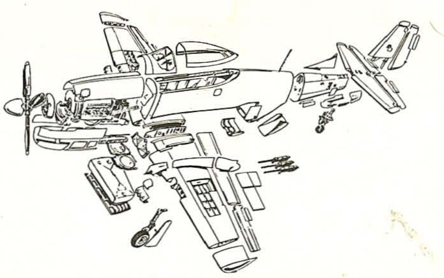

CONVAIR B-36 "PEACEMAKER"

VOLUME 24

DENNIS R. JENKINS

- XC-99 Cargo Transport
- Survivor Restoration
- 20-mm Cannon Details
- YB-60 Prototypes
- Reconnaissance Models
- FICON Fighter Carriers

WARBIRDTECH SERIES

VOLUME 24

CONVAIR
B-36 "PEACEMAKER"

By Dennis R. Jenkins

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The Convair B-36 "Peacemaker"

PREFACE

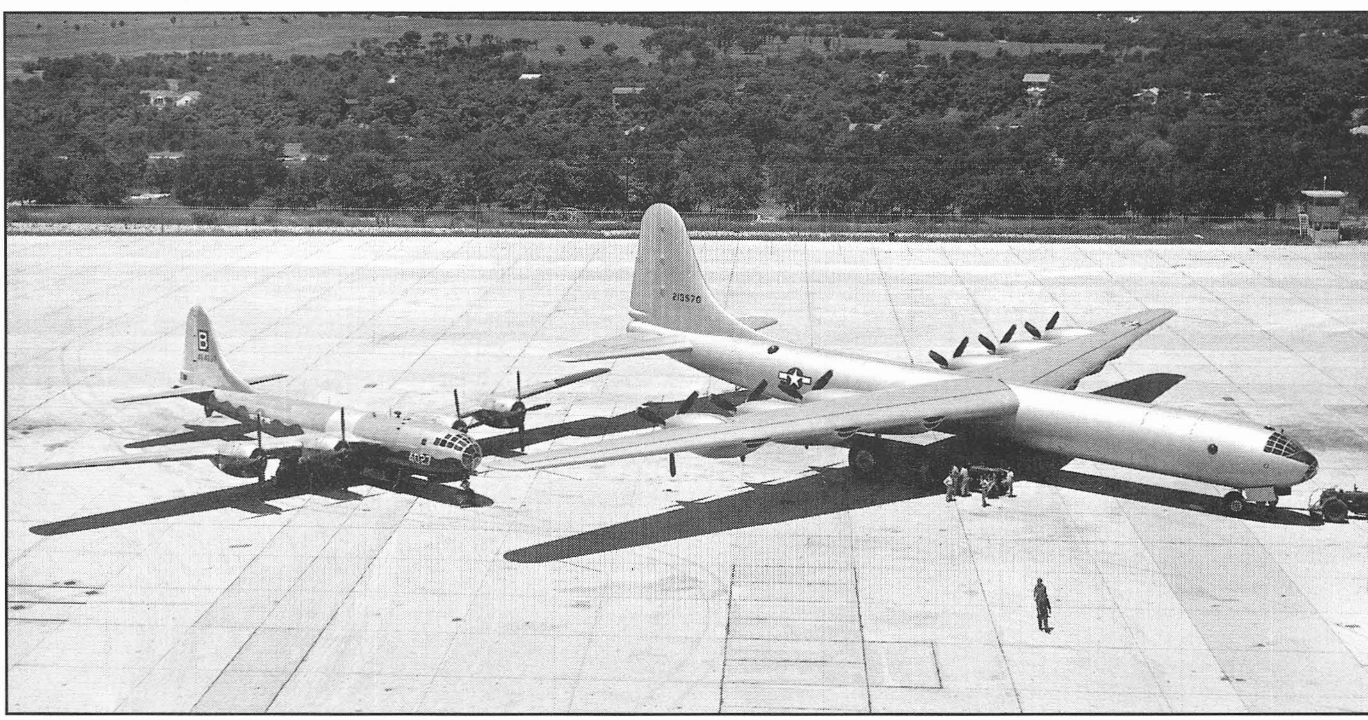
AUTHOR'S NOTES AND ACKNOWLEDGEMENTS

The story of the B-36 is unique in American aviation history. It survived near-cancellation on six separate occasions during an extremely protracted development program. It was the symbol of a bitter inter-service rivalry between the newly-formed Air Force and the well-established Navy over who would control the delivery of atomic weapons during the early years of the Cold War. The atomic mission also brought with it the lion's share of the funding and prestige, things both services wanted to keep largely for themselves. As a result of the bickering, the aircraft was the subject of numerous Congressional investigations and countless newspaper and magazine articles.

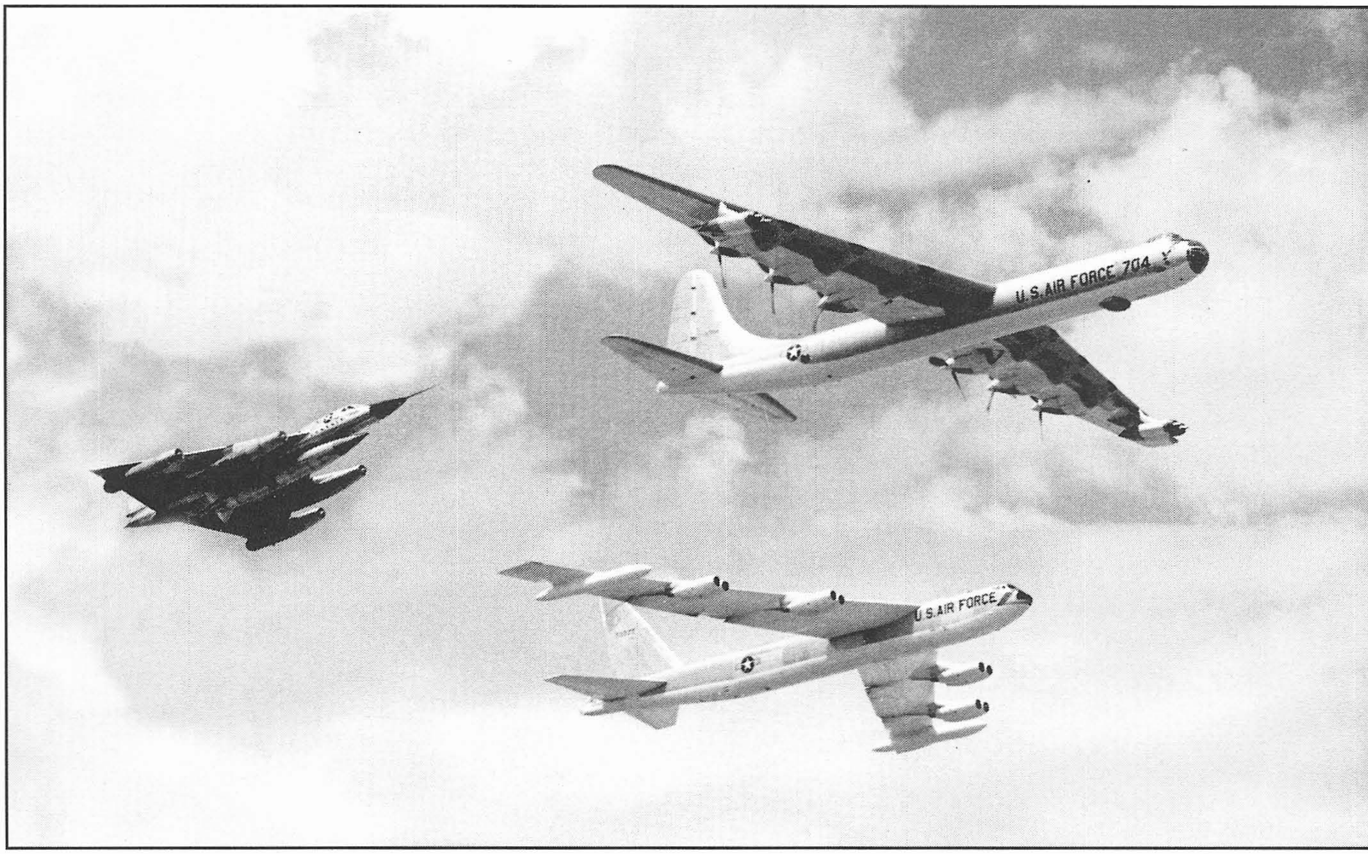
The B-36 served for only ten years, and there were always questions as to whether it could accomplish its assigned strategic bombardment mission. Nobody denied the aircraft was slow, although sometimes it was hard to ascertain just how slow it really was in comparison to other aircraft. But it flew so high that it probably did not really matter. Few fighters of its era could climb as high, and surface-to-air missiles were just being developed. It was not until the last few years of its service life that the B-36 was particularly vulnerable.

The aircraft also had very long legs, a necessary attribute for the first truly intercontinental bomber. It is hard to imagine a modern aircraft remaining airborne for two days without refueling, but it was not particularly unusual for the B-36 to do so. It took a long time to fly 10,000 miles at 250 mph.

Then there were the problems. The B-36, despite its seemingly obsolete appearance, pushed 1950s state-of-the-art further than any other aircraft of its era. Its sheer size brought structural challenges, while its high-altitude capabilities brought engine cooling and other problems. Sophisticated gun and bombing systems presented development, maintenance, and operational headaches. A lack of training for the ground crews, and severe spare parts shortages exacerbated the problems.



The XB-36 dwarfs a Boeing B-29 Superfortress, showing the sheer size required to achieve intercontinental range without in-flight refueling. (Convair via Don Pyeatt)



A late-production B-36J Featherweight III leads its replacement (Boeing B-52 Stratofortress, lower center) and another famous Convair bomber, the supersonic B-58 Hustler in a formation flight on 30 May 1958. In February 1959, the last B-36 was retired, and SAC became an all-jet command. (Convair via LMTAS/Mike Moore)

In the end, the B-36 did its job. It is difficult to tell if it could have successfully performed its nuclear bombardment mission, although the success of its strategic reconnaissance missions is less in doubt. But for the first ten years of the Cold War, the "Big Stick" carried by the B-36 was the major deterrent available to the Free World. The fact that we are here is a testimony to its effectiveness.

Curious about the quotation marks around the name "Peacemaker"? Convair had proposed the name for the B-36, but several groups opposed its adoption, and in the end the B-36 spent its entire career without an official moniker. "Peacemaker" is generally used, but was never officially sanctioned.

This book did not turn out quite the way I had originally envisioned it. I had intended to cover a lot more of the protracted development process the airplane went through. But along the way I discovered a lot of interesting data on various proposed derivatives and modifications that had not been covered in other B-36 books. I, therefore, decided to present some of these.

There have not been many books on the B-36. The most recent is by Meyers K. Jacobsen, who assembled six other authors to create *Convair B-36 – A Comprehensive History of America's "Big Stick"* published by Schiffer Military History, 1998. The book's 400 pages allow the authors to go into significantly more detail on many subjects than is possible here. However, they also seemed to miss some things. Nevertheless, anybody truly interested in the B-36 should look at a copy of Meyers' book.

No book can be produced in a vacuum, and more so than most, this one is the product of a great deal of cooperation from a great many people. As always, my good friends Mick Roth, Tony Landis, and Terry Panopalis supplied information and photographs. Fellow Warbird Tech authors Frederick A. Johnsen and Peter M. Bowers also contributed. But many B-36 enthusiasts also donated from their personal collections. Don Pyeatt was first and foremost, going to great lengths to secure photos for me. He also put me in contact with many others: Bill

Plumlee, Joe Trnka, Richard Freeman, John W. "Zimmy" Zimmerman, Max Campbell, and Wendell Montague. Lt. Don Kerr and TSgt. Brandon Lindsay at the 7th BW also provided assistance.

Lockheed Martin Tactical Aircraft Systems (LMTAS) was very helpful. Lockheed purchased the Convair portion of General Dynamics in 1993, and LMTAS was formed after the merger with Martin Marietta. Mike Moore and Karen Hagar at LMTAS were most accommodating in finding photos for me, frequently of things never before seen in print. Lastly, but certainly not least, were Ray Wagner and A.J. Lutz at the San Diego Aerospace Museum, who allowed me access to their extensive archives. And my sincerest thanks to Ed Lieser, also at the San Diego Aerospace Museum, who was largely responsible for getting me interested in aviation history in the first place, much longer ago than either of us probably wants to admit.

Those interested in supporting one of the truly great collections of aviation history in this country should contact the:

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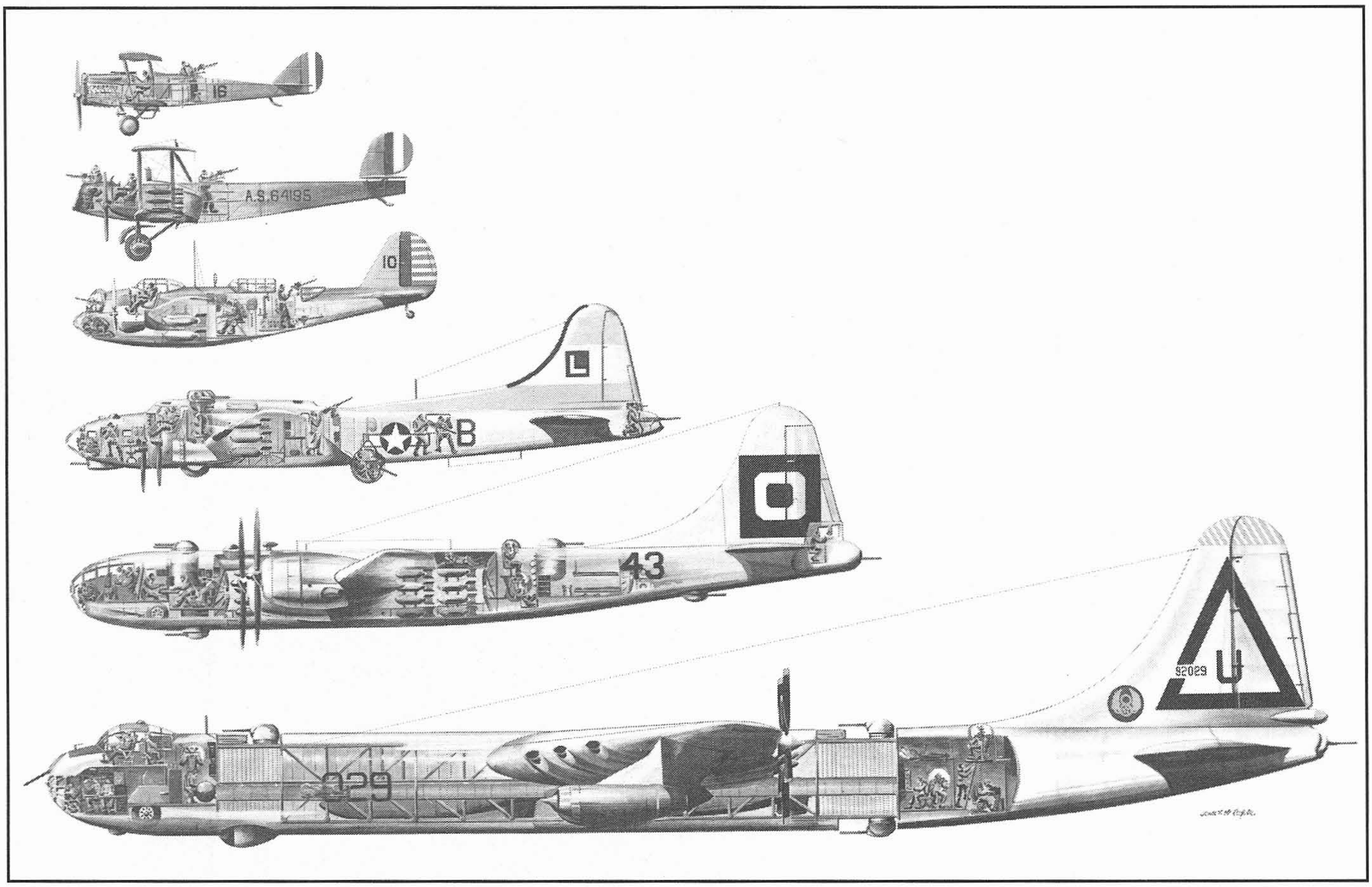
Dennis R. Jenkins
May 1999



"Development: DH-4 to B-36 of the Bomber" by John McCoy. The evolution of the bomber in the United States began with the De Havilland DH-4, although most of those in U.S. service were actually manufactured by Dayton-Wright or Fisher Body (General Motors). The DH-4 saw extensive use in World War I. Next is the Martin-Curtiss NBS-1, which equipped the Army bombing squadrons during the mid-1920s. The NBS-1 used two of the same Liberty engine that the DH-4 had used a decade earlier. The first monoplane shown above is the Martin B-10, which began to enter service in the mid-1930s. It was quickly outclassed by the next aircraft shown – the famous Boeing B-17G Flying Fortress, which along with the Convair B-24 Liberator (not shown) saw extensive use during World War II. Boeing did not rest on its laurels, and by the end of the war had introduced the B-29 Superfortress, the product of one of the most amazing manufacturing programs ever undertaken. At the bottom of the illustration is the Convair B-36, the largest piston-engined bomber ever produced. (U.S. Air Force – DVIC photo DF-SC-84-08873)

1 DESPERATION

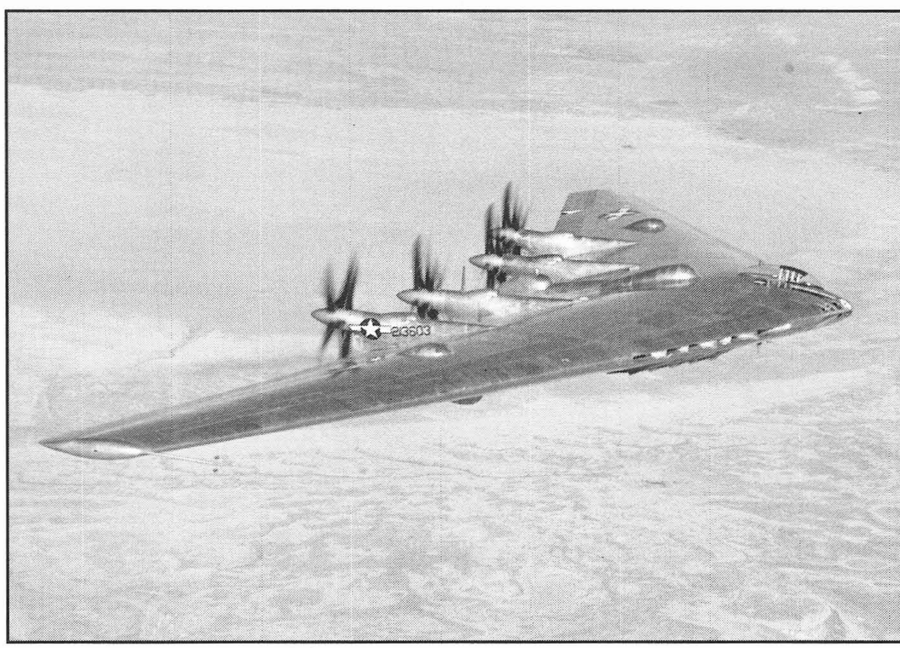
AND REPRIEVE

The B-36 can trace its genesis to the early days of 1941, a time when it seemed that England might fall to a German invasion, leaving the United States without any bases outside the Western Hemisphere. It had taken Hitler just 20 days to crush the Polish army in September 1939, and but a few weeks for the German forces to speed across the Low Countries and France in 1940. Hitler's rapid successes against Russia would serve to underscore the concern. Consequently, the Army Air Corps (the Army Air Forces were not formally established until 20 June 1941) felt that it needed a truly intercontinental bomber, one that could bomb targets in Europe from bases in North America. To accomplish this, the Air Corps drafted requirements for a bomber with a 450-mph top speed, a 275-mph cruising speed, a service ceiling of 45,000 feet, and a maximum range of 12,000 miles at 25,000 feet with 10,000 pounds of bombs.[1]

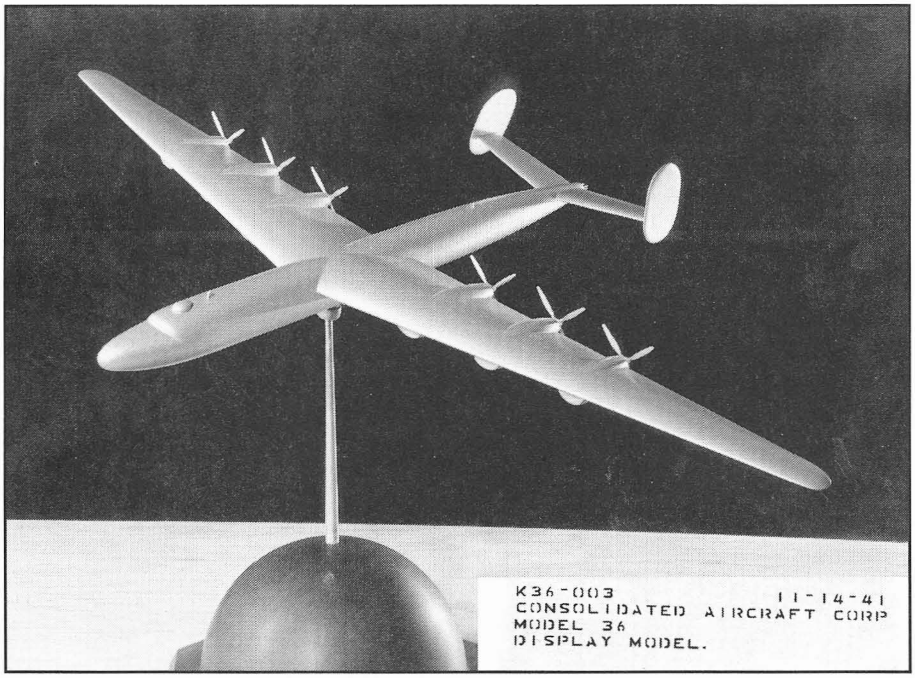
(It should be noted that until the early 1950s, the range and speed of military aircraft were usually shown in statute miles. Afterwards, the Air Force began to measure speed in knots and range in nautical miles.)[2]

Requests for preliminary design studies were released to Consolidated and Boeing on 11 April 1941. Consolidated Vultee was awarded $135,445 for the studies, while Boeing received $435,623. Northrop was asked on 27 May 1941 to provide further information on its "flying wing," although the aircraft only had an 8,000 mile range with 2,000 pounds of bombs. Later, the Glenn L. Martin Company was also solicited but declined; work on the XB-33 and a Navy production contract were already stretching the company's engineering resources. Douglas was awarded a contract on 19 April 1941 to determine if the Allison V-3420 liquid-cooled engine could be used in a bomber. Douglas had also been working for several years on the XB-19, which had only recently flown and was the largest aircraft ever built in the United States. The Air Corps planned to use the XB-19 as a flying laboratory to gather information to assist in the design and construction of future very-large aircraft.

On 3 May 1941 preliminary design data was submitted by Consolidated under the company designation Model 35, with Boeing and Douglas also submitting preliminary data. The results were not encouraging. All the manufacturers were having trouble designing an aircraft to meet the requirements. A conference was held on 19 August in an attempt to accelerate the bomber project, mainly by scaling back the requirements. This was a relative concept, and the revised requirements were still a tall order – a minimum range of 10,000 miles, and an



During the mid and late 1940s the Northrop B-35 flying wing designs were considered serious threats to the B-36 procurement. In the end, the B-35 (and later B-49 jet-powered versions) could not overcome several handicaps inherent in the flying wing design and were abandoned. It would be 30 years before Northrop finally built an operational flying wing – the B-2A Spirit. (Tony Landis Collection)



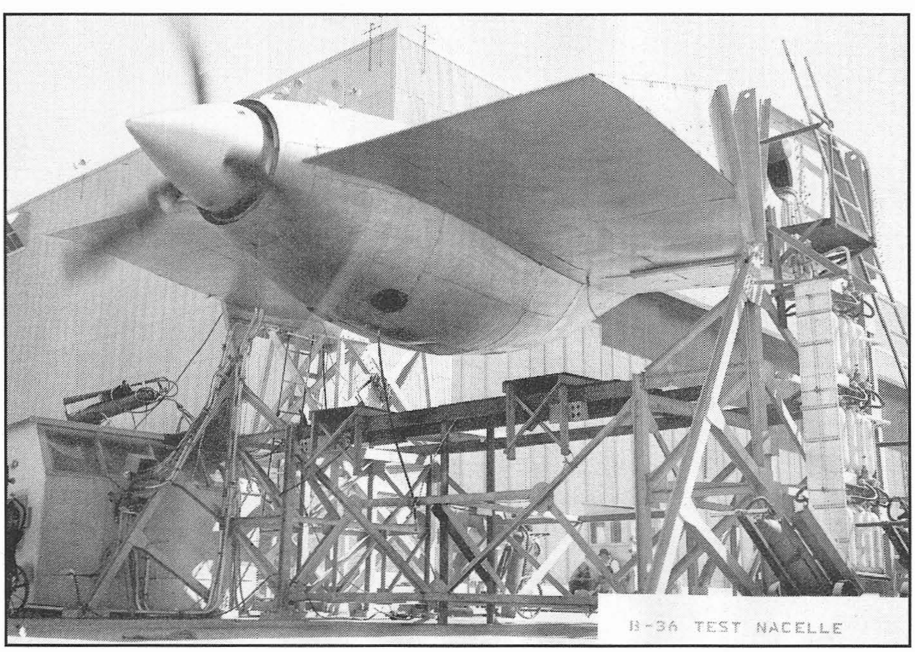
This is how Model 36 looked on 14 November 1941. Noteworthy are the characteristic Consolidated Vultee twin vertical stabilizers and the lack of obvious gun turrets. Later versions of this design used a variety of manned gun turrets before the final remote-control units were adopted. (Convair via the San Diego Aerospace Museum)

effective combat radius of 4,000 miles with a 10,000-pound bomb load. This was four times the combat radius of the new B-17, and almost double that specified for the upcoming B-29. The requirements further specified that the bomber should have a cruising speed between 240 and 300 mph, and a 40,000-foot service ceiling. Each of the three contractors revised preliminary data to accommodate the new requirements, and all submitted proposals in early September 1941.

The Army Air Forces decided that the Consolidated proposal was the most promising. Douglas had stated that it did not desire to undertake an "out-and-out 10,000-mile airplane project," and proposed the development of the 6,000-mile range Model 423, which was rejected. The Boeing designs (Models 384 and 385) were "overly conservative" and the Army Air Forces believed that Boeing had not yet "really tackled the [long-range] airplane design with the necessary degree of enthusiasm."

Brig. Gen. George C. Kenney, commander of the Experimental Division and Engineering School at Wright Field, Ohio, issued a recommendation to further pursue the Consolidated design. This was based on a detailed proposal that had been submitted on 6 October 1941, which asked for $15 million plus a fixed-fee of $800,000 for development, mockup, tooling, and production of two experimental long-range bombers. Delivery of the first aircraft would take 30 months, and Consolidated stipulated that the project could not be "entangled with red tape" and constantly changing requirements.

On 15 November 1941 a contract (W535-ac-22352) was issued for



A full-scale test nacelle was constructed for the P&W R-4360 engine and Curtiss-Wright 19-foot-diameter propeller. This allowed Convair to refine the installation and also gather acoustic and vibration data with the engine running. (Convair via the San Diego Aerospace Museum)

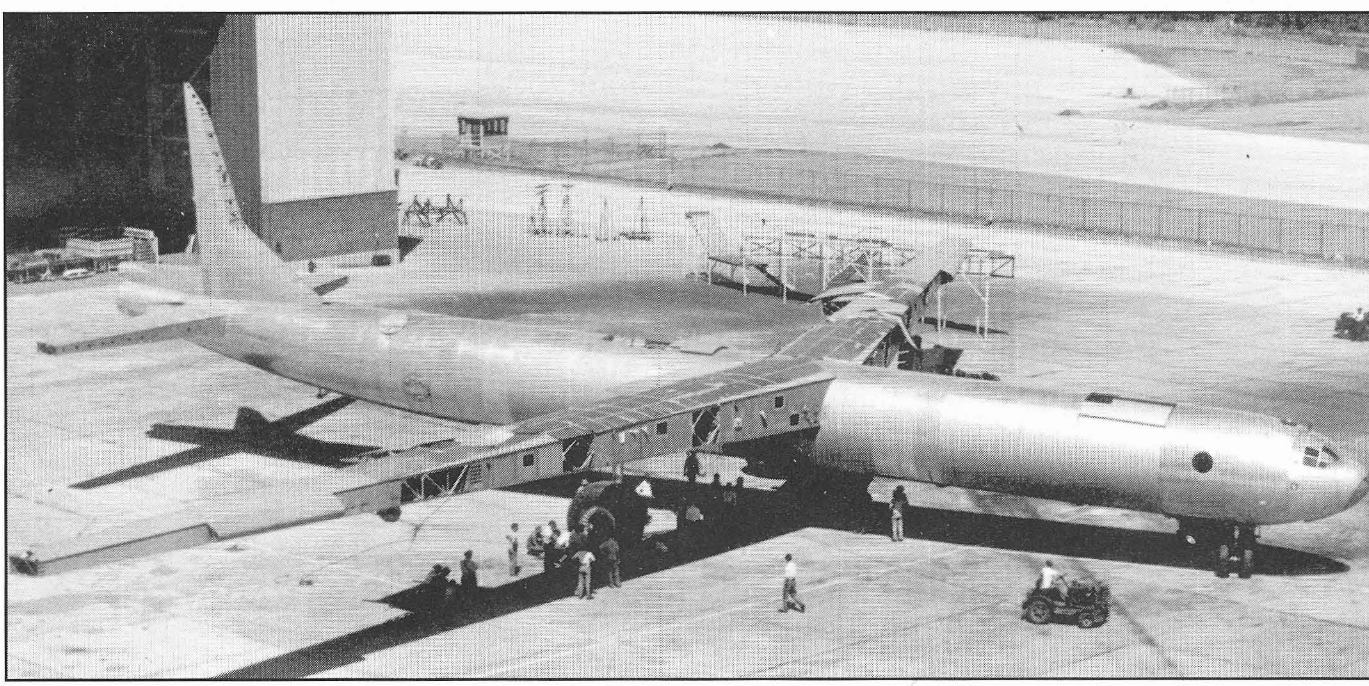
two XB-36 experimental aircraft to be built at the Consolidated facility in San Diego. The first was to be delivered in May 1944 and the second six months later. Consolidated knew it would be faced with design problems that had not been previously encountered, mostly stemming from the aircraft's sheer size and operating altitude.[3]

Although the aircraft was generally similar to the original Model 35, there were sufficient differences for Consolidated to assign the aircraft a new model number – 36 – conveniently the same as the official designation. By this time, the wing span had grown to 230 feet with an area of 4,772 square feet, versus an original 162 feet and 2,700 square feet. The aircraft was to be powered by six 28-cylinder Pratt & Whitney "X-Wasp" air-cooled radial engines (which would become the R-4360 Wasp Major), each driving a 19-foot-diameter three-bladed Curtiss-Wright propeller in a pusher configuration. The engines were to be accessible for maintenance in flight through the wing, which was 7.5 feet thick at the root. In 1941 the new engine only existed on paper, although it was essentially two 14-cylinder R-1830 engines joined at the crankshaft.

Six fuel tanks with a capacity of 21,116 gallons were incorporated into the wing. The 163-foot long fuselage had four separate bomb bays with a maximum capacity of 42,000 pounds. The forward and aft crew compartments were pressurized and connected via a 25-inch diameter, 80-foot long pressurized tube through the bomb bays. Crewmen could use a wheeled trolley to slide back and forth. Four rest bunks, a small galley, and toilets were provided for the crew. Defensive armament was to consist of five 37-mm cannon and ten .50 caliber machine guns distributed between four retractable turrets (two on top of the fuselage, two on the bottom) and a tail turret.

The 10,000-mile range was a challenge, dictating that the aircraft would spend almost two days in the air. Every effort would have to be made to minimize the base drag of the aircraft, meaning particular attention would need to be paid to the aerodynamic smoothness of the skin and skin-joints. To emphasize the problem at hand, Consolidated constantly reminded engineers that for every pound of extra weight, it took two pounds of fuel to complete the 10,000-mile mission.

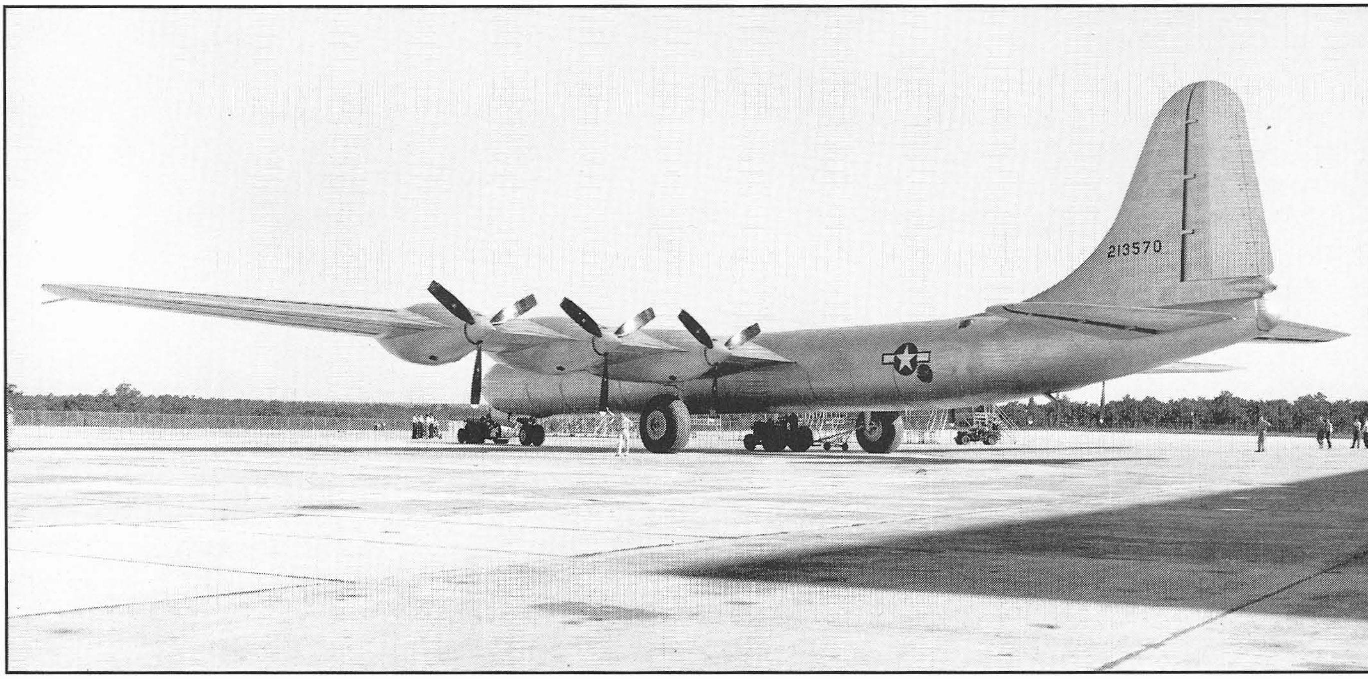
For six months Convair refined the design, exerting every effort to control weight, reduce drag, and eliminate the various developmental challenges typically encountered. The B-36 mockup was finally inspected on 20 July 1942, and weight estimates were much high-



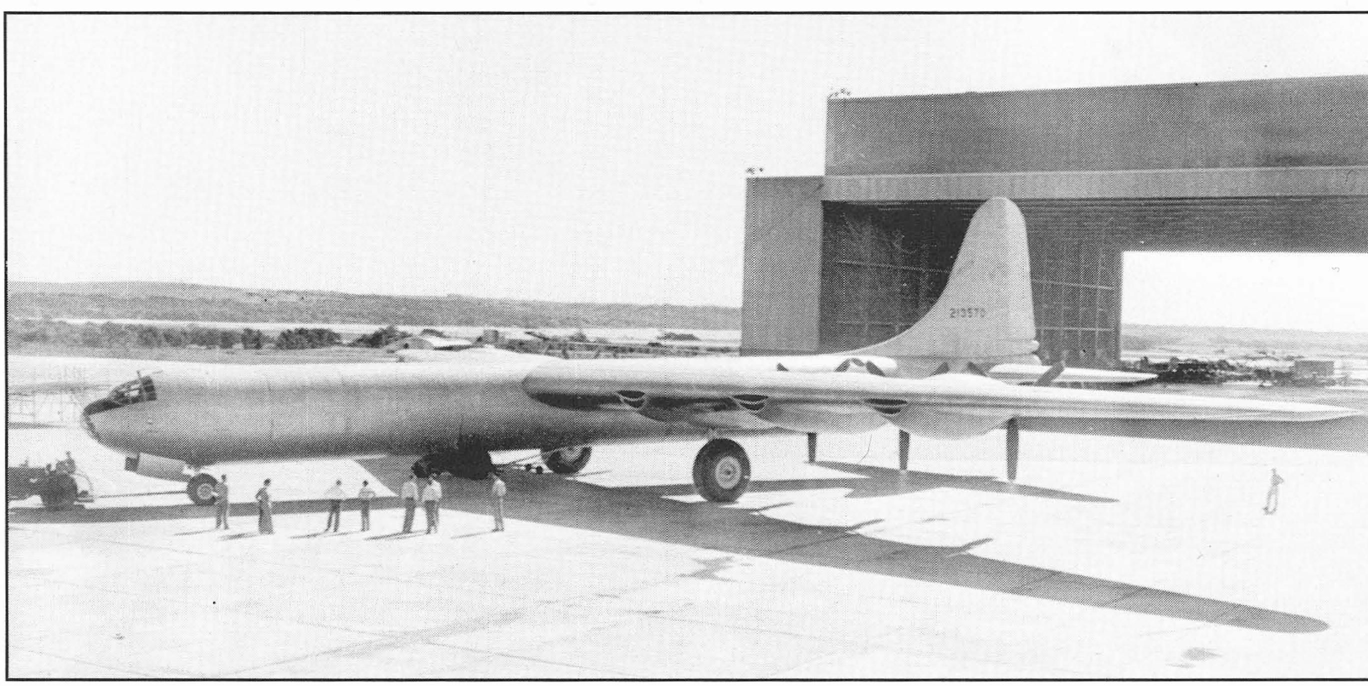
The partially-complete XB-36 is rolled out of the Experimental Building at Fort Worth. Note the open gun doors behind the cockpit. Only the XB-36 used the "stepped" canopy shown here – all later aircraft (except the NB-36H) used a "bubble" canopy. (Convair via the San Diego Aerospace Museum)

er than expected. The Mockup Committee wanted to reduce the defensive armament and crew in order to meet the 10,000-mile range requirement. But some members argued that such changes would render the aircraft tactically useless and relegate it to much the same role as the XB-19 "flying laboratory." If a compromise could not be reached, many members believed that the entire project should be cancelled. The Mockup Committee eventually agreed to delete only "less necessary" items of equipment such as some crew comfort and survival items, providing some weight reduction, and allowing the program to continue.

A month after the B-36 mockup inspection, Consolidated suggested shifting the XB-36 project from San Diego to its new government-



Looking much more complete, the XB-36 shows the massive 110-inch single main landing gear originally used for the undercarriage. The main landing gear doors have not yet been installed. (Convair via the Peter M. Bowers Collection)



leased plant in Fort Worth. The move was completed in September 1942, less than 30 days after being approved, but development was set back several months. Progress on the B-36 was also slowed because of the higher priority of the B-24 Liberator, and later the B-32 Dominator.

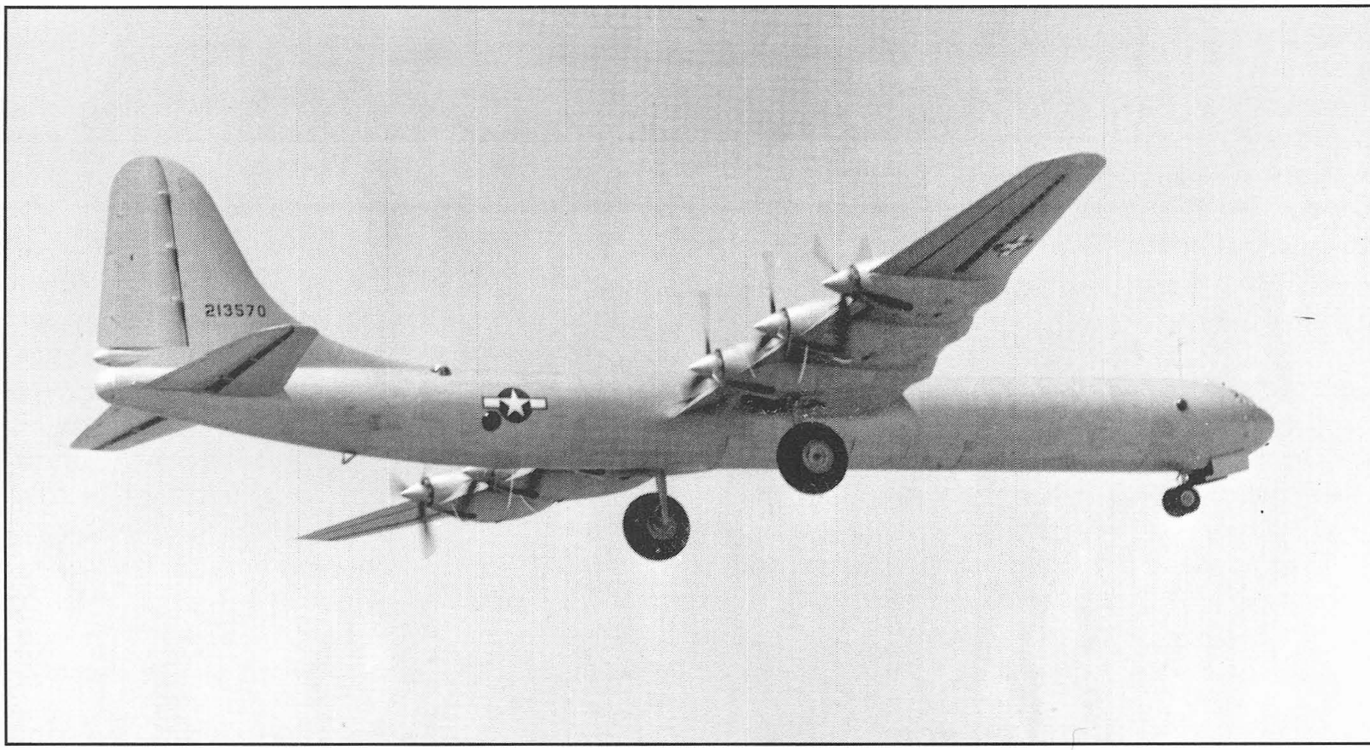
Consolidated wanted the government to place a production order for the B-36, claiming that two years could be saved if preliminary work on production aircraft could be accomplished in parallel with the experimental models. However, the war in the Pacific was not going well, and the Army Air Forces felt that it should devote its full effort to aircraft which could contribute to the war effort sooner, so the request was denied.

Another Consolidated request in the summer of 1942 fared somewhat better. The Army Air Forces agreed to the development of a XC-99 cargo version of the XB-36, provided that one of the two experimental bombers was produced at least three months ahead of the cargo aircraft. Consolidated wanted the XC-99 to test the engines, landing gear, and flight characteristics of the forthcoming XB-36s. Consolidated also believed the XC-99 could be ready to fly much sooner than either of the XB-36s because armament and other military equipment was not required. Consolidated accepted the government's conditions and a $4.6 million contract was approved by year's end. See Chapter 2 for details on the C-99 project.

On 17 March 1943, the Consolidated Aircraft Corporation merged with Vultee Aircraft, Inc., becoming the Consolidated Vultee Aircraft Corporation. This name was often truncated to "Convair," although this did not become official until 29 April 1954, when Consolidated Vultee Aircraft Corporation became the Convair division of the General Dynamics Corporation.[4] In between those years Convair referred to itself alternately as CVAC, or CONVAIR (all caps).

The 110-inch main landing gear was a great deal taller than an average person. This is actually the XC-99 with its flight crew prior to its maiden flight. (Convair via the San Diego Aerospace Museum)

The size of the XB-36's vertical stabilizer is well illustrated here with two men standing next to it. By any measure the B-36 was a large aircraft, especially by 1946 standards. (Peter M. Bowers Collection)



The XB-36 made a 37-minute maiden flight on 8 August 1946 piloted by Beryl A. Erickson and G.S. "Gus" Green, assisted by seven other crewmembers. The large main wheels had not been fitted with their doors. At the time this was the largest and heaviest landplane ever flown. (Convair via the San Diego Aerospace Museum)

While Consolidated wrestled with weight increases and various developmental troubles, world events suddenly boosted the importance of the B-36. By the spring of 1943, China appeared near collapse and neither the B-17 or B-24 had sufficient range to operate over the vast distances of the Pacific. The B-29 was in the early stage of production, but was proving to be troublesome in initial service. The parallel development of the B-32, generally considered by the Army Air Forces as "insurance" in case the B-29 failed, was not progressing as well as expected, largely because of a low priority rating in the national production scheme. Neither of these types could reach Japan from the continental United States, and extremely bloody battles would need to be won before the Mariana Islands could become bases for B-29 or B-32 operations. Speeding up B-36 development might provide a way for attacking the Japanese home islands directly.

The war in the Pacific dominated the discussion at the "Trident Conference" between President Roosevelt and Prime Minister Churchill in May 1943. After various consultations, Secretary of War Henry L. Stimson waived the customary procurement procedures and authorized the Army Air Forces to order the B-36 into production without waiting for the completion of the two experimental aircraft. A letter of intent for 100 B-36s was signed on 23 July, each with an estimated cost of $1,750,000, just slightly more than two days' cost of the war effort. Subsequently, the priority assigned to the B-36 program was raised, although still not to a level equal to the B-29, or even the B-32.

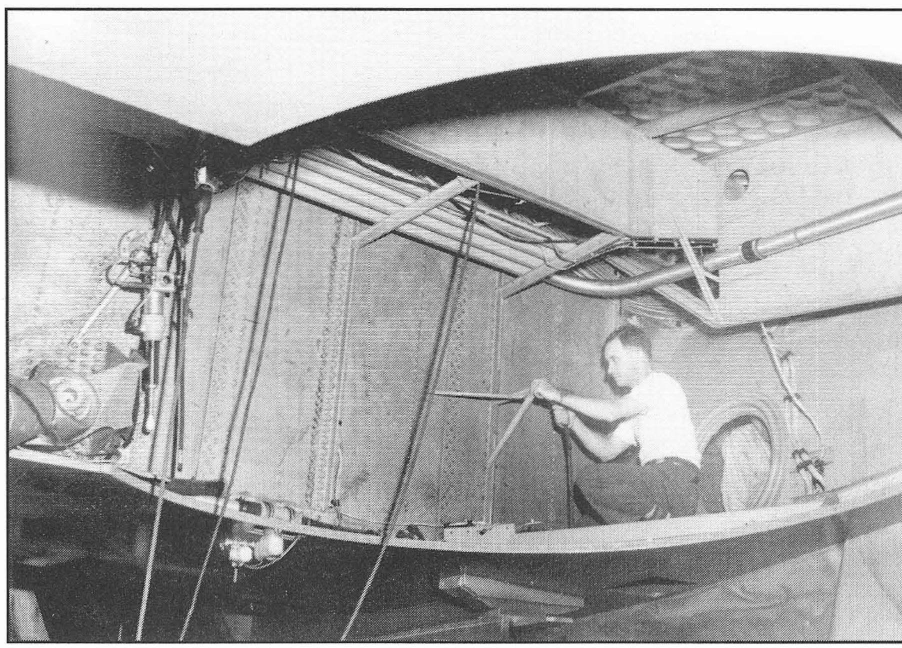
Further evaluation led to the Model 36's original twin tail being deleted in favor of a single 47-foot-high vertical stabilizer. This would decrease weight by 3,850 pounds, provide additional directional stability, and lower base drag. It was also in keeping with the general direction of the aircraft industry at the time. Some of the initial designs for the B-29 had twin tails, but Boeing had selected a taller single unit for production. Even Consolidated had begun with twin verticals on the B-32, but the type ultimately used a single vertical surface (the PB4Y-2 variant of the B-24 also was produced with a single vertical). The modification was approved on 10 October 1943, along with a 120-day delay in delivery. At best the Army Air Forces would not get its first XB-36 until September 1944.

By mid-1944, the military situation in the Pacific had improved. The Marianas campaign was near its end, and preparation was being made to deploy B-29s from these bases to attack the Japanese home islands. The B-29's initial difficulties were almost resolved, and the Army Air Forces believed that a very long-range bomber was no longer urgently needed. Nevertheless, on 19 August 1944, a $160 million contract (including a $6 million fixed fee) was finally signed to cover the production of 100 B-36s. The contract did not carry any priority rating at all, essentially ensuring that no parts or materials could be procured as long as the war lasted. Delivery schedules, however, were unchanged, and the first production B-36 was to be delivered in August 1945, with the last arriving in October 1946.

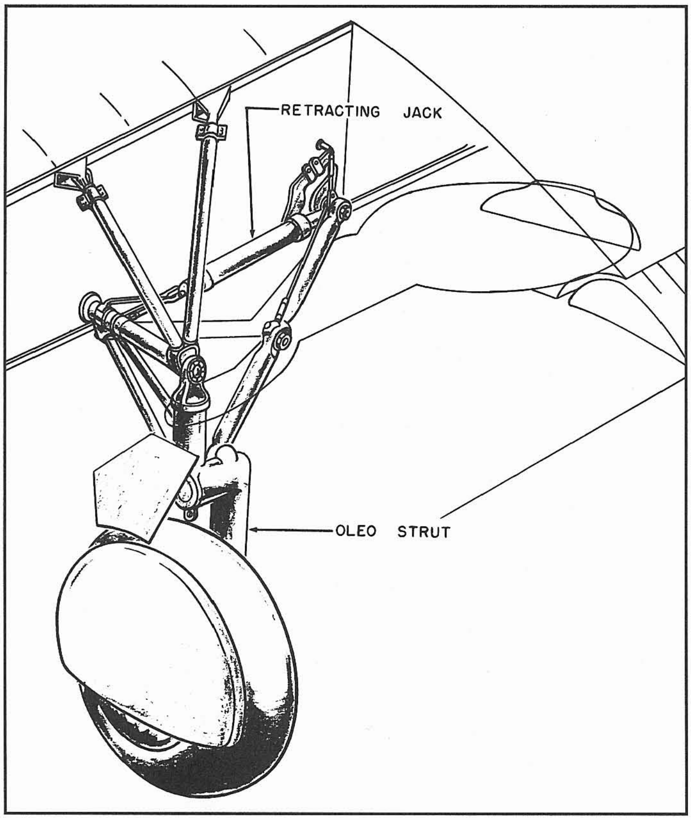
Following the surrender of Germany and the end of the war in Europe, production contracts were drastically cut back. Aircraft production was cut by 30% on 25 May 1945, a reduction of 17,000 aircraft over an 18-month period.[5] However, the contract for the B-36 was untouched. The enormous losses suffered in seizing island bases in the Pacific confirmed that there was a need for a very long-range bomber. The atomic bomb, unlikely to remain an American monopoly, was another strategic justification. Inasmuch as U.S. retaliation would have to be quick, there would be no time for conquering faraway bases. And, realistically, a very-long-range bomber could be the best deterrent for the immediate future. From the economic standpoint, the B-36 also looked good. It out-performed the B-29 and the B-35 "flying wing" for long-range missions, and was cheaper by half to operate than the B-29 in terms of cost per ton per mile.

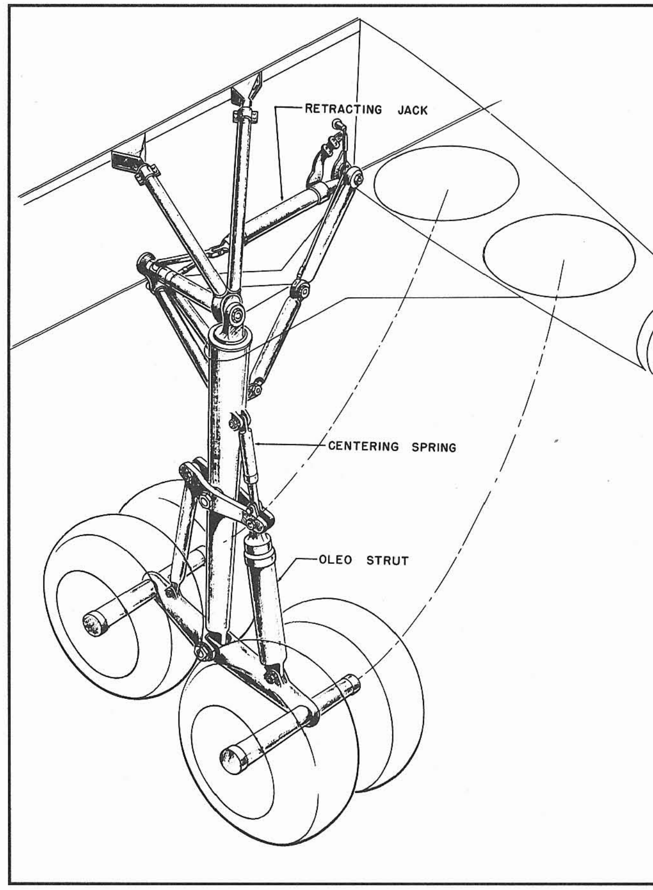
While the fate of the B-36 program vacillated with changing wartime priorities, the aircraft's development remained painfully slow. By 1945 Convair still worried over the weight of the R-4360-25 engine – Pratt & Whitney's third version of the proposed X-Wasp. Adding nose guns, a new requirement based on wartime experience, required an extensive rearrangement of the forward crew compartment that would become standard beginning with the second aircraft. New radio and radar equipment would add at least 3,500 pounds, and potentially more if the antenna of the AN/APQ-7 bombing radar could not be installed in the leading edge of the wing. Coupled with a 2,304-pound increase for the engines, this presented a serious weight problem for the engineers.

Due to the sheer size of the aircraft, the landing gear presented its own set of problems. In order to fit the main gear into the wing when it was retracted, Convair decided to use a single 110-inch diameter tire per side. Unfortunately, this concentrated most of the aircraft's weight onto only two comparatively small contact patches, one on each side of the aircraft. Only three runways in the world were capable of withstanding the huge amount of stress this would impart when the aircraft landed and during taxi. (The three were Fort Worth, Eglin Field in Florida, and Fairfield-Suisun AAF – later Travis AFB – in California.) In addition to the runway restrictions, it put the entire aircraft at risk if a single tire failed at a critical time. The 110-inch Goodyear tires, each weighing 1,475 pounds, were the largest aircraft tire ever manufactured. Each tire had a 225-pound



The wheel wells on the XB-36 had to be large to accommodate the 110-inch tires. Note the scale of the workman. The hatch just behind him led into the fuselage, and it was possible to crawl into the wings during flight to perform minor maintenance on the engines or landing gear. (San Diego Aerospace Museum Collection)





The four-wheel undercarriage used the same mounting locations as the original 110-inch gear. Unfortunately it was thicker, necessitating a "bump" on top of the wing and "bulged" landing gear doors to accommodate the larger bogie. These bumps are clearly evident on any photo of later B-36s. Only the XB-36, YB-36, and XC-99 used the large 110-inch landing gear, and all were later fitted with the revised undercarriage. (Convair)

inner tube pressurized to 100 psi. The wheels weighed 850 pounds each, and the dual multiple-disk brakes on each wheel added 735 pounds. Complete with the struts and ancillary equipment, each main gear weighed 8,550 pounds.

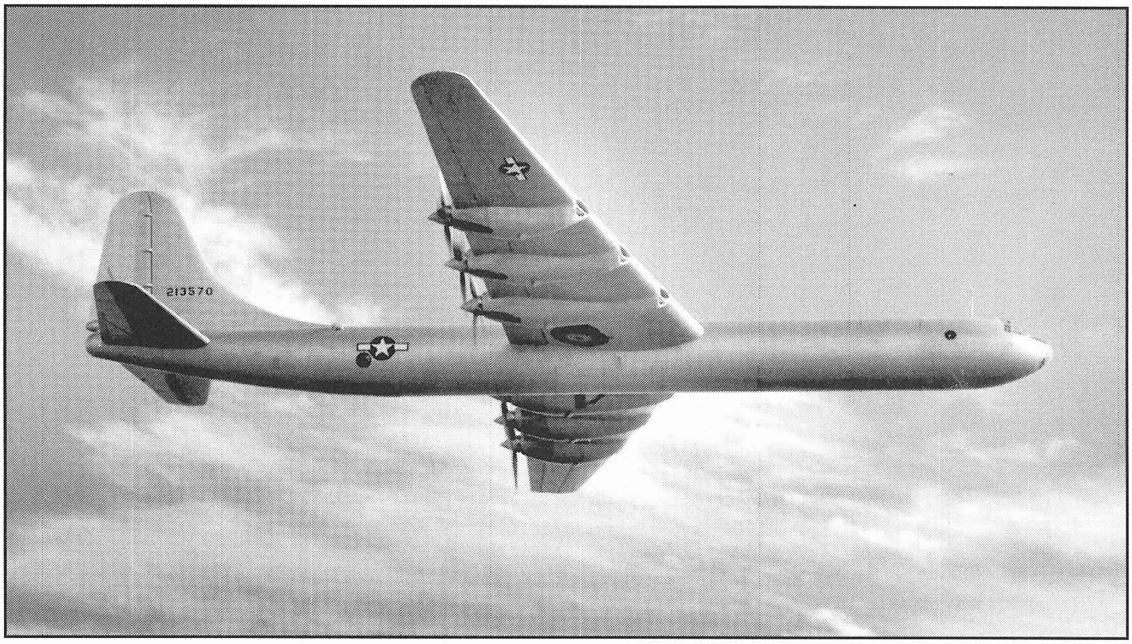
In mid-1945 the Army Air Forces directed that a new landing gear be devised to distribute the aircraft weight more evenly, thus reducing the need for specially built runways. One of the major problems encountered with designing a multi-wheel undercarriage for the B-36 had been developing adequate brakes. These were finally available and the production four-wheel bogie-type undercarriage using 56-inch tires allowed the B-36 to use any airfield suitable for the B-29.

Revised estimates of the XB-36's performance were proving discouraging. Gross weight had increased from 265,000 to 278,000 pounds. Top speed had gone from an estimated 369 to 323 mph, while the service ceiling had dropped from 40,000 to 38,200 feet. Although it was estimated that the B-36 might not be any faster than the B-29, it was still vastly superior in terms of range and payload. A single B-36 would cost three times as much as a B-29, but could carry 72,000 pounds of bombs an estimated 5,800 miles, while the B-29 could only carry 20,000 pounds of bombs a little over 2,900 miles. In terms of airframe weight, the B-36 was 1.85 times as heavy as the B-29, but it could carry over 10 times the bomb load to 5,500 miles.

Meanwhile, faulty workmanship and substandard materials were discovered in the XB-36. In fairness to Convair, substituting materials was a generally accepted practice during the war years, especially for experimental aircraft. It was expected that the resultant structural limitations would render the XB-36 useless, other than as a test vehicle for the initial flights.

Finally, on 8 September 1945, almost six years after the original contract had been signed, the XB-36 (42-13570) was rolled out.

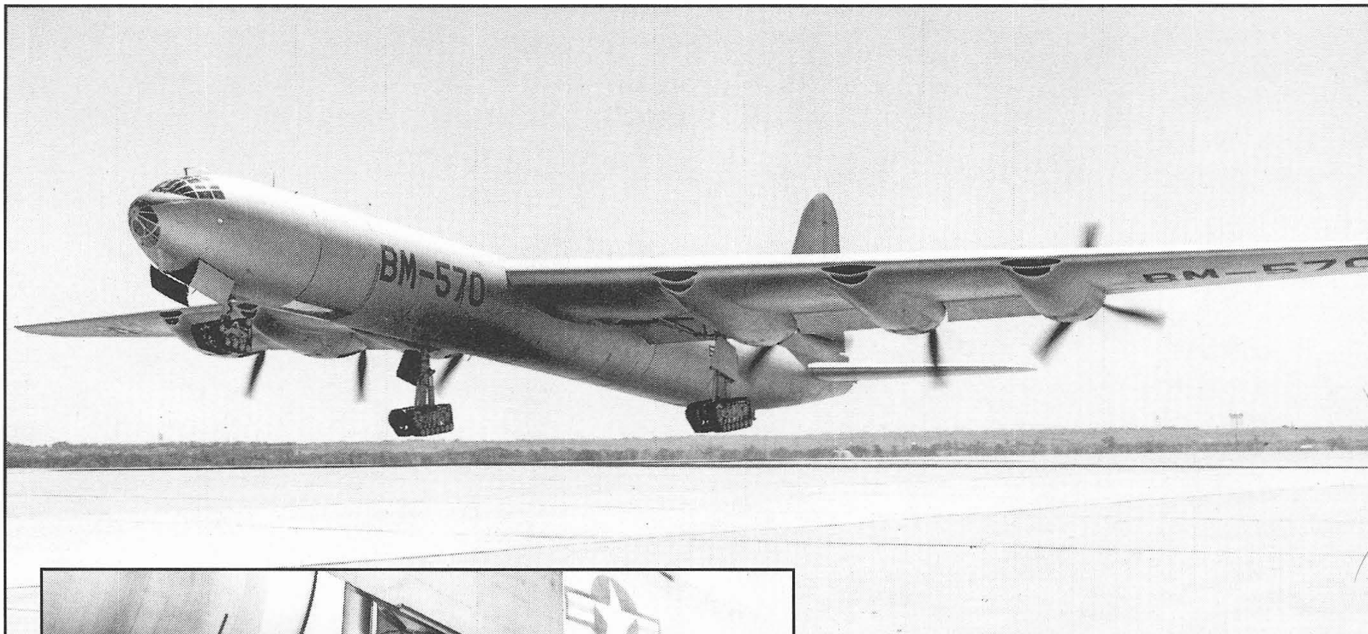
A careful examination of this XB-36 photo will show that the main landing gear is still uncovered. Like all early B-36s, the XB-36 did not carry any defensive armament. (Convair via the Peter M. Bowers Collection)

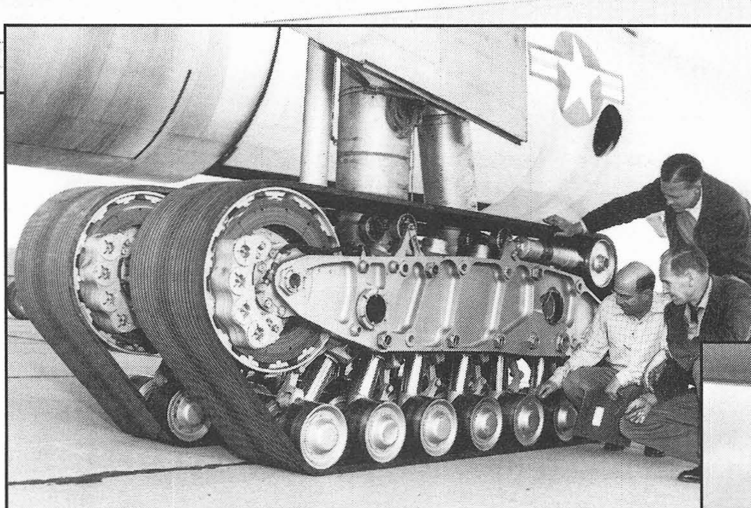


The aircraft made a 37-minute maiden flight on 8 August 1946 piloted by Beryl A. Erickson and G.S. "Gus" Green, assisted by seven other crewmembers. At the time, it was the largest and heaviest aircraft ever flown. Early test flights confirmed that the aircraft's top speed was only about 230 mph, and two major problems soon surfaced – a lack of proper engine cooling and propeller vibration, although both of these had been extensively investigated during wind tunnel testing. Eventually a two-speed cooling fan was developed that largely eliminated the cooling problem, but nothing could be done to ease the vibration other than strengthening the affected structures, which added yet more weight.

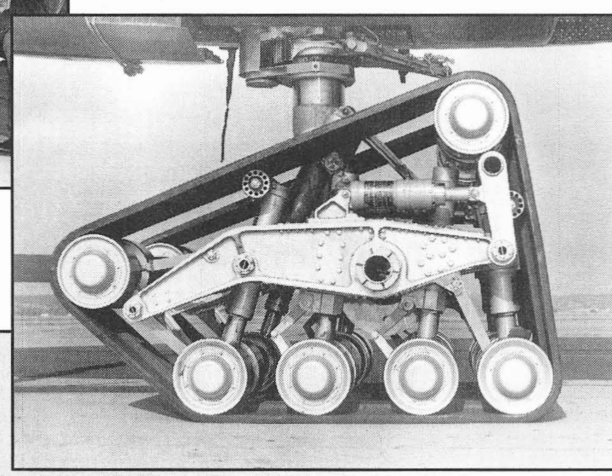
The XB-36 was flown for 160 hours by pilots from the Air Materiel Command before being returned to Convair where company pilots made 53 additional test flights, logging a total of 117 hours. The airframe was ultimately turned over to the Air Force in mid-1948, but as predicted, it had limited operational value and was used primarily for ground training.

The XB-36 was eventually fitted with the revised undercarriage, shown here. The "buzz" number adorned the forward fuselage of most Air Force aircraft in the late 1940s and early 1950s. The "BM" indicated the type of aircraft, while the "570" was the last three digits of the serial number. (Peter M. Bowers Collection)





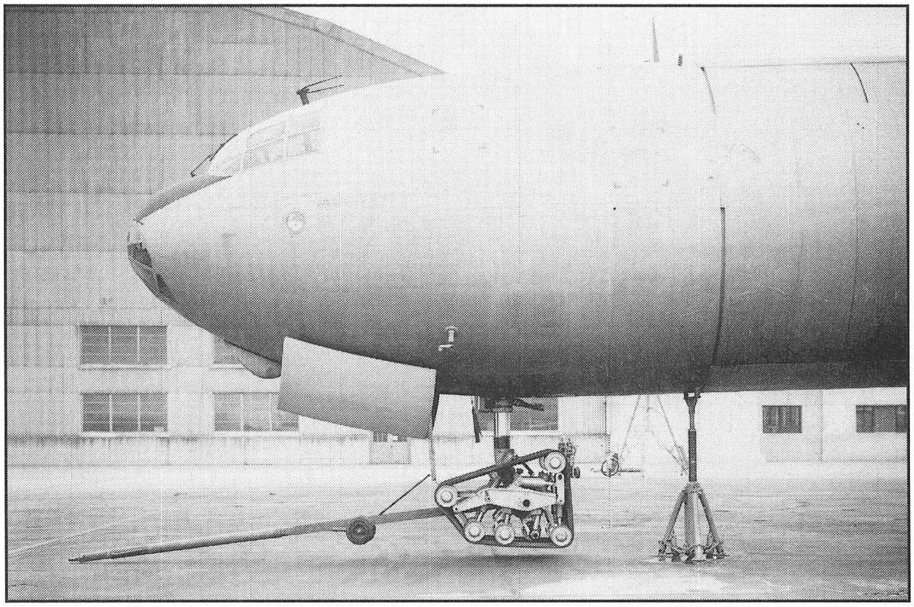
The unique tracked landing gear that was tested on the XB-36, as well as a B-50 and C-82 around the same time. (All four photographs from Convair via LMTAS/Mike Moore)



The main tracks (above) and nose tracks (right) would have allowed landing on relatively unprepared fields.

The XB-36 did participate in one further test series. In early 1950, an experimental track-type landing gear was installed, similar to ones also tested on a C-82 and B-50 around the same time. The specially-designed Goodyear system of V-belts applied only 57 psi to the runway, compared to 156 psi for the production four-wheel bogie-type undercarriage. This would, in theory, allow very large aircraft to use unprepared landing strips. The first flight using the new landing gear came on 26 March 1950, and the resulting "screeching" sound was unnerving to those aboard the aircraft and nearby observers. There was never any intention of using the track-type gear on production B-36s, and the XB-36 was used as a testbed simply because it was a heavy aircraft that was available. There was, however, some consideration given to using it on production C-99 transports.

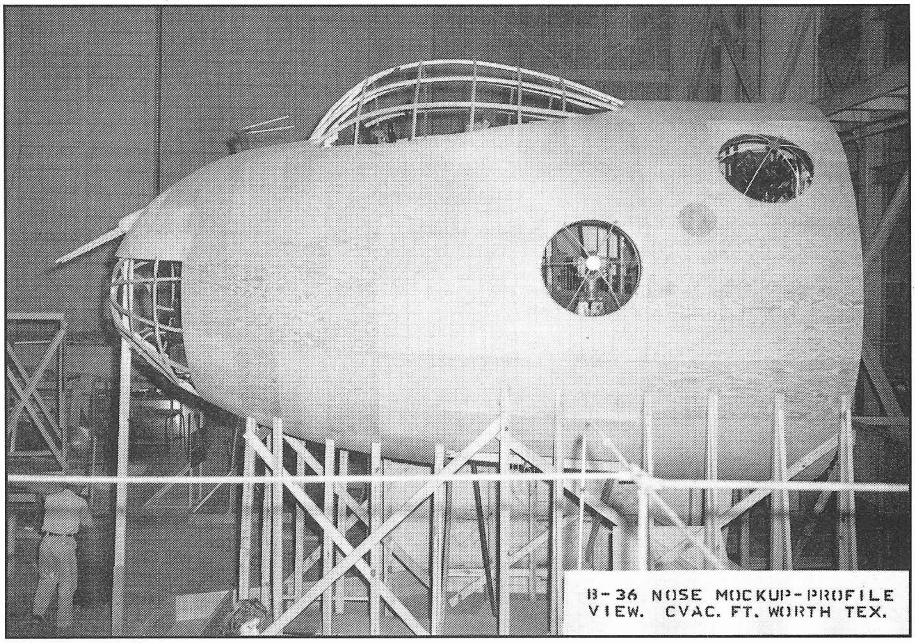
The Air Force decided it would be too expensive to bring the XB-36 up to production standards, and the aircraft was officially retired on 30 January 1952. The engines and all serviceable equipment were removed, and the aircraft fell into disrepair in a corner of the Fort Worth field. In May 1957 the airframe was given to the Carswell AFB fire department to be used as a fire-fighting aid, and was eventually consumed by fire.



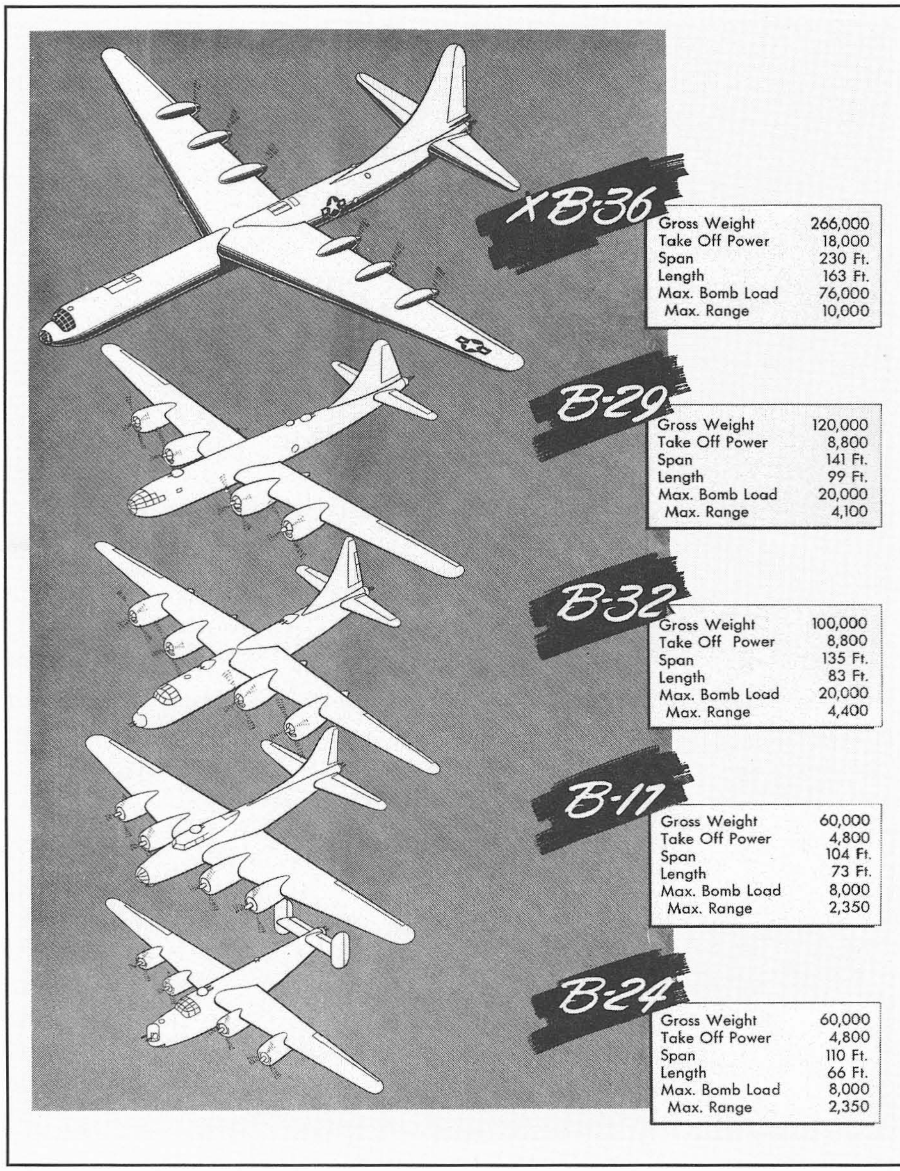
The XB-36 nose profile was more streamlined than the final production nose, but lacked a nose turret, something that had proven valuable during combat. Note the unusual tracked landing gear in this shot. (Convair via the San Diego Aerospace Museum)

YB-36

A decision had been made on 27 April 1945 to finish the second XB-36 (42-13571) closer to the expected production standard. The aircraft was redesignated YB-36 and flew for the first time on 4 December 1947. It had the new raised flight deck and canopy, a redesigned forward crew compartment, and provisions for a nose turret. However, the YB-36 still had the original single-wheel undercarriage, and lacked armament and most production equipment. During the YB-36's third flight, it reached an altitude of more than



Convair built a wooden mockup of the revised nose section to work out the details of the equipment and turret installation. Compare with the original nose profile of the XB-36. (Convair via the San Diego Aerospace Museum)



Early diagram developed to show the relative size and performance of the heavy bomber force. (San Diego Aerospace Museum Collection)

40,000 feet, an outstanding achievement for the time.[6]

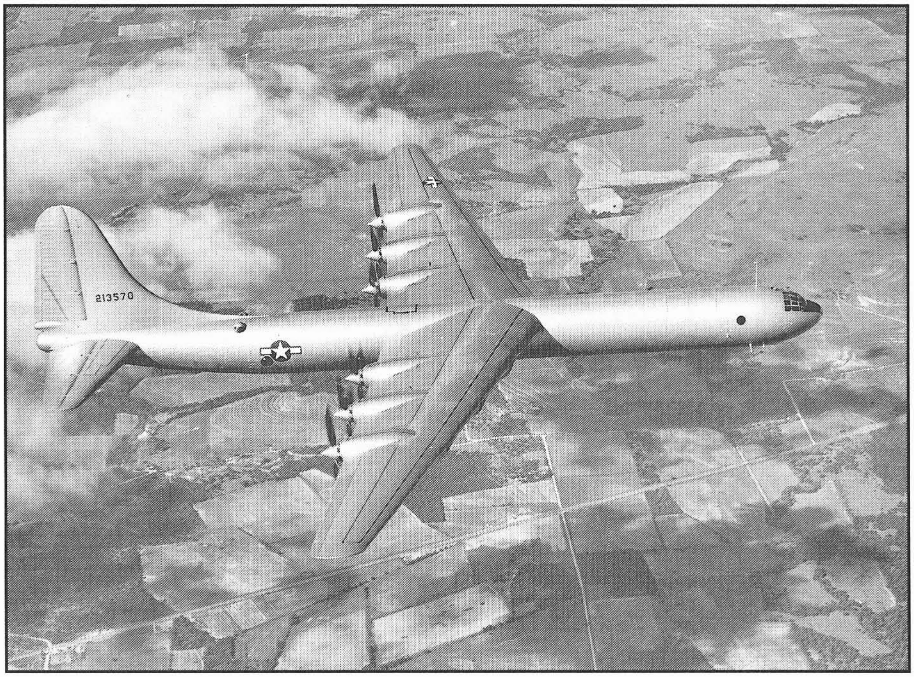
After 89 hours of flight testing, the YB-36 was grounded for modifications. The single-wheel landing gear was replaced by the production bogie-type four-wheel undercarriage and 3,500 hp R-43660-41 engines were fitted. The aircraft first flew in this configuration in June 1948, and was turned over to the Air Force on 31 May 1949. The YB-36 was returned to Convair in October 1950 to be converted into an RB-36E in lieu of the first B-36A. During early 1957 the aircraft was retired and turned over to the Air Force Museum at Wright-Patterson AFB, but it was scrapped when the new museum facility was built. Parts of the aircraft were acquired by Ralph Huffman for $760, or roughly 3/4 cent per pound. Huffman subsequently sold the remains to Walter Soplata, and they still exist on a farm in Newbury, Ohio.

Strategic Air Command

The Strategic Air Command (SAC) had been established by the Army Air Forces on 21 March 1946, and on 12 December 1946 its commander, Gen. George S. Kenney, suggested that the contract for 100 production B-36s should be reduced to only a few service test aircraft. At the time Boeing was in the process of developing the B-50 (originally designated B-29D), which Kenney believed had superior performance. Among the shortcomings Kenney listed for the B-36 were an effective range of only 6,500 miles, insufficient speed, and a lack of armor for the crew and fuel.[7] (This was somewhat unfair since the underwing skin was a fairly thick 75ST aluminum alloy that was resistant[8] to 0.50-caliber rounds striking from most angles, and production aircraft were equipped with armored engine cowlings[9] and protection for the oil tanks and pumps.)

However, neither the Air Staff nor Lt. Gen. Nathan F. Twining, the commander of the Air Materiel Command, agreed with this assessment. They felt that the problems being experienced by the B-36 were normal at this stage of development and could be solved given sufficient time. Besides, the B-50 could not fly as far as the B-36 without resorting in-flight refueling, and was not that much faster. In any case, the B-36 was the only long-range bomber that was capable of carrying the full range of nuclear weapons in the arsenal, many of which were too large for smaller aircraft like the B-50. Gen. Carl Spaatz, the commander of the Army Air Forces, agreed with Twining, and the B-36 contract was retained.

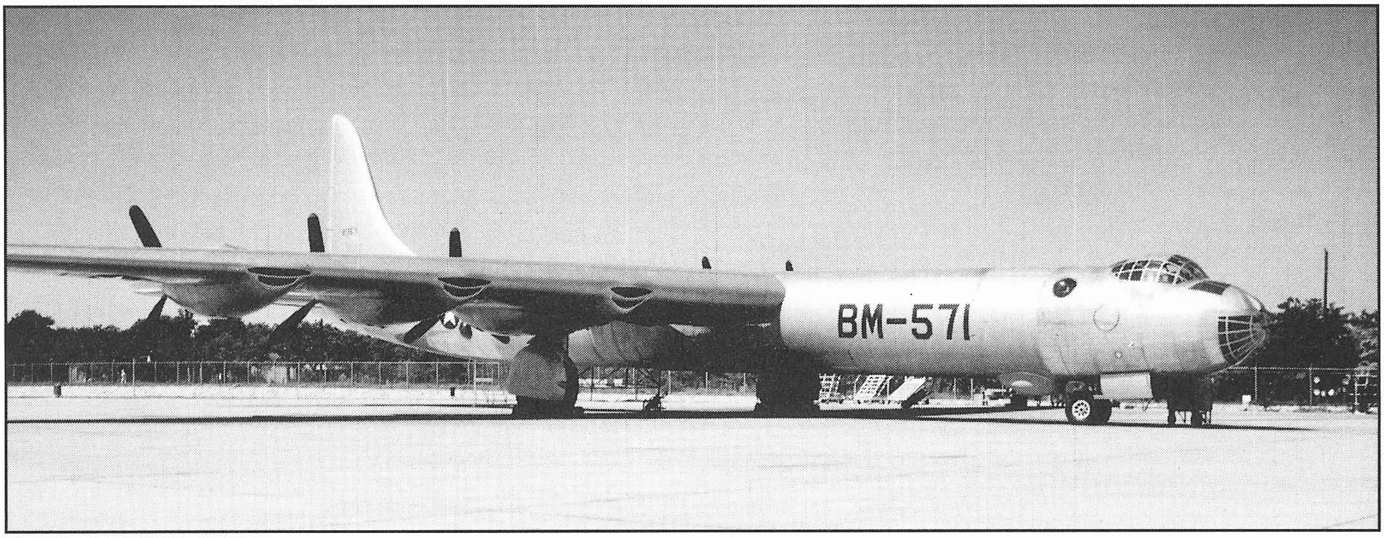
On 6 January 1947, the results of a planning exercise for a global flight by a B-36 was published by Convair. The aircraft would be extensively modified – all armament would be removed; all antennas and radomes would be removed and faired over; the sighting blisters would be faired over; the bombardier, radar operator, and all gunners seats, instrument panels, and other equipment would be removed; the bunks and galleys would be replaced by lighter weight versions; and even the forward crew compartment carpeting would be deleted. In all, this would save over 5,000 pounds. Six new flexible fuel cells would be installed in the wings, along with four bomb bay fuel tanks. Bomb bay No. 4 would also include provisions for four Aerojet 4,000 pounds-thrust JATO bottles to be used during takeoff.[10]



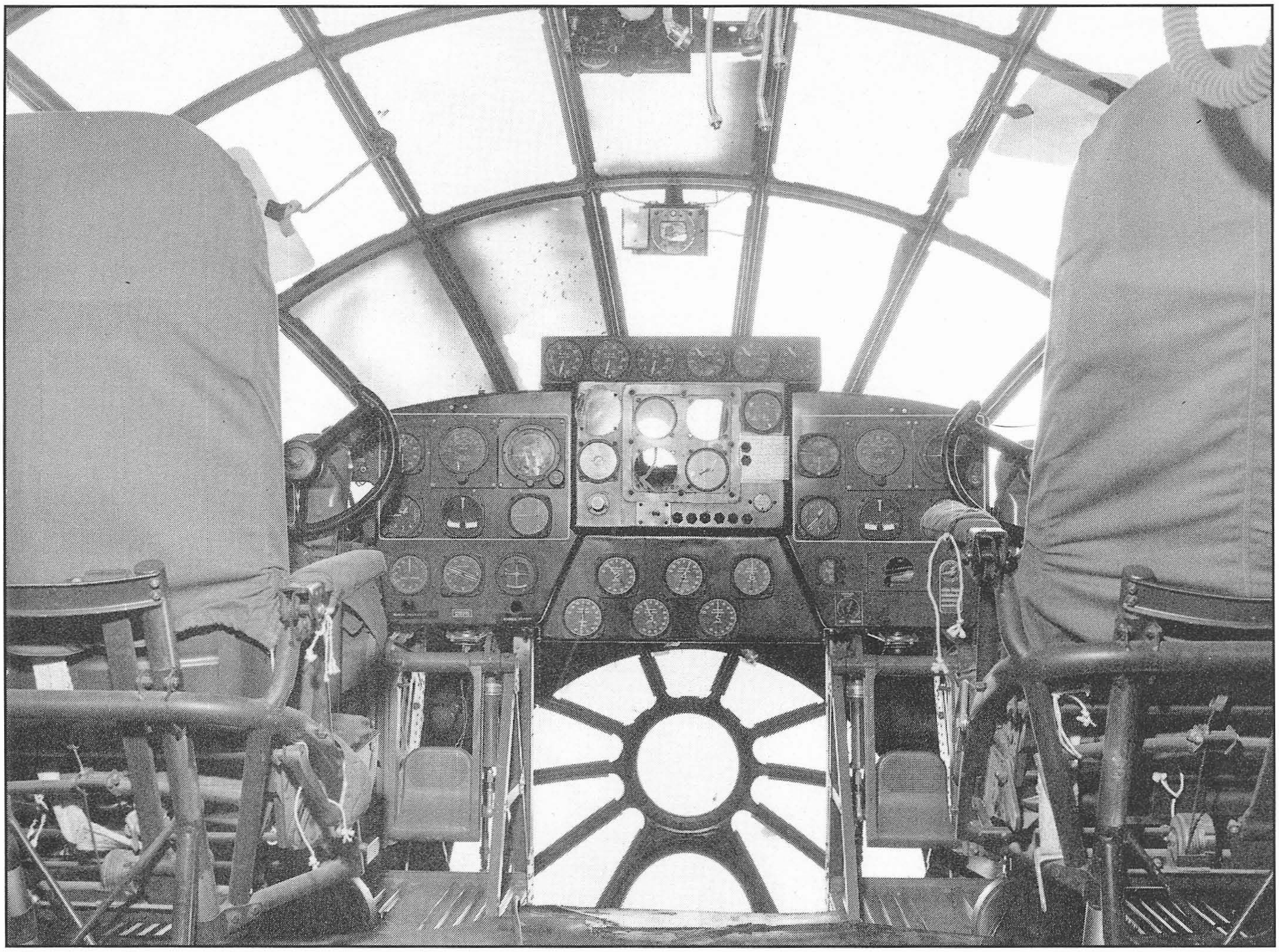
The clean shape of the original XB-36 was the result of careful design to minimize drag and increase range. (Convair via Don Pyeatt)

The modified aircraft would have a range of 15,075 miles at an average cruising speed of 210 mph. The proposed route used Idlewild Airport, New York, as the departure point, following a great circle route over Scotland, Berlin, the Black Sea, Southern Russia, Tokyo, the Aleutian Islands, Vancouver Island, and finally landing at Fort Worth. If favorable winds were encountered, a landing back at Idlewild would be attempted. The fact that part of the flight was over Russia, by a strategic bomber, did not seem to deter the planners. As far as is known, the flight never took place, but no reason could be ascertained.

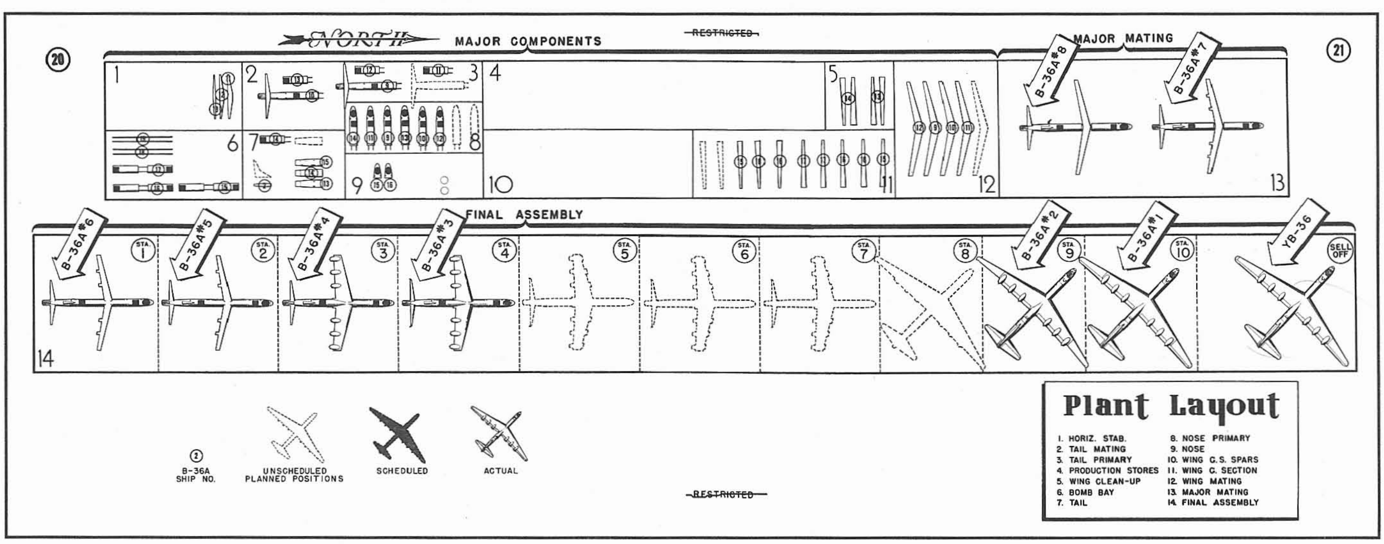
The Air Force was established on 26 July 1947, when the National Security Act of 1947 became law. It began functioning as a separate service on 18 September 1947.



The YB-36 shows the new nose profile, complete with a dummy nose turret, but the aircraft sill has the original 110-inch landing gear. This too would soon be replaced by production units. (Convair via LMTAS/Mike Moore)



The flight deck of the XB-36 was decidedly different than later aircraft. Note the glazed bombardier's nose forward of the two pilots. (Convair via the San Diego Aerospace Museum)



The B-36 manufacturing area in Fort Worth very early in the program. Note the YB-36 at the "Sell off" station. Convair updated the drawing for each monthly status report. (Convair via the San Diego Aerospace Museum)

Powerful Engines

The Pratt & Whitney R-4360 Wasp Major engine was used to power the B-36, B/KB-50, C/KC-97, C-119, and C-124 aircraft. It represents the most technically advanced and complex reciprocating aircraft engine produced in large numbers in the United States. The passing of the KC-97 from the Air Force inventory in the late 1970s marked the closing of the era of both the large piston and turbo-supercharger within the Air Force.

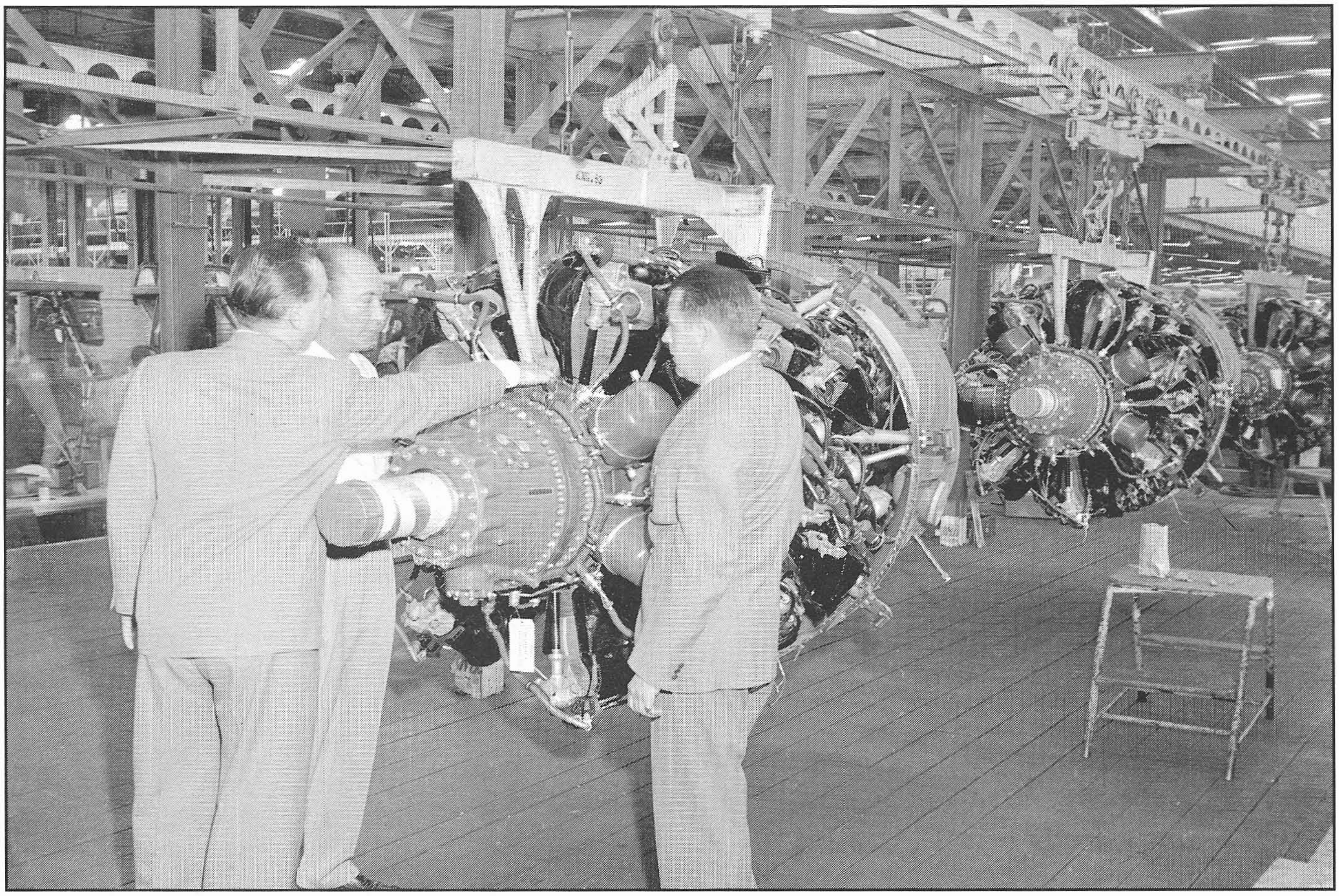
The R-4360 was a 28-cylinder, 4-row radial, air-cooled engine with a gear-driven turbo-supercharger. As the name suggests, the engine displaced 4,360 cubic inches (71.5 liters), and each cylinder had a 5.75-inch bore and 6.00-inch stroke (155.7 cubic inches per cylinder). The engine had a compression ratio of 6.7:1 in most applications. The R-4360 was 96.5 inches long, with a diameter of 55.0 inches. At maximum rpm, each piston was covering 2,700 feet per minute. The engine weighed 3,670 pounds (the weight and dimensions are for the basic engine only, without the turbochargers or reduction gears). The engine used 2,500 pounds of 115/145-grade aviation fuel and 25,000 pounds of air per hour at maximum output.[11]

The engine was rated at 3,500 hp (3,000 in early –25 engines; 3,800 in very late –53 units), but what is frequently overlooked was its torque rating. At 1,000 rpm, each engine provided 840 pound-feet of torque – by 3,000 rpm this had increased to a staggering 7,506 pound-feet, measured at the crankshaft. Because of the gearing selected, this was increased to over 20,000 pound-feet at the propeller shaft.

At 20,000 feet, without the use of turbo-supercharging, the R-4360-41 would have had an output of only 1,000-hp; with its use the power output improved to 3,500 hp. The R-4360 used two different supercharging techniques. An "internal supercharger" was mounted in the airstream immediately behind the carburetor and before the cylinders. This impeller was driven by the crankshaft by a gear train at a fixed ratio. At takeoff the impeller was turning at 17,000 rpm, with a tip speed of nearly 700 mph. The use of this supercharger was somewhat of a trade-off, for although it provided a doubling of the intake pressure (from 30 inches to over 60 inches), it also added a lot of heat to the intake charge, which is generally undesirable. It was felt that the benefits outweighed the drawbacks. Interestingly, it took 435 hp to drive the supercharger. It was worth it – the supercharger increased the power output by a staggering 1,930 hp.

Each engine was also provided with two General Electric Model B-1 exhaust-driven turbo-superchargers arranged in parallel. The primary purpose of the turbos was not to increase the power rating of the engine. Instead, they allowed the sea-level power rating to be maintained up to 35,000 feet, with a gradual degradation at altitudes above that. At sea level, the turbos had the theoretical ability to provide 300 inches of manifold pressure – obviously something that could not be allowed to happen. Automatic controls kept the turbos

A cut-away R-4360 being prepared for display with the Fort Worth B-36J. Note the four rows of cylinders, and the supercharger on the left side of the photo. (Aviation Heritage Association via Don Pyeatt)



R-4360 engines awaiting installation at Convair. (Convair via LMTAS/Mike Moore)

from overcharging the system at any given altitude. Each turbocharger was equipped with an intercooler to remove waste heat from the air.[12]

Heat rejection was a major concern with an engine as powerful as the R-4360. The design of the cylinders and the use of forged aluminum alloy for the heads and barrel muffs permitted the machining of closely-spaced deep fins that provided a 30% increase in exposed fin area over that previously available from cast heads. Cooling air was inducted at the leading edge of the wing and was boosted by a large engine cooling fan before being routed by a series of baffles around the engine. Control over the amount of cooling air admitted to the nacelle was controlled by positioning an "air plug" located between the trailing edge of the nacelle and the propeller. These air plugs performed the same function as the cowl flaps on tractor installations.[13]

Even the Curtiss-Wright constant-speed, full-feathering, reversible propellers on the B-36 were unique. Their sheer size, and the fast rate-of-pitch change required, eliminated the possibility of using the traditional electric motor to control the variable pitch. Instead the designers developed a system that used the part of the power being transmitted via the propeller shaft. Pitch change was accomplished by transmitting power taken from the rotating propeller shaft through a series of gears and four clutch mechanisms. Hydraulic pressure was generated by a self-contained oil pump, and used by either the clutch or the brake on each blade, as directed via electrical control signals from the cockpit. Engine exhaust was directed through the propeller hub to the hollow blades to prevent ice buildup.

[1] Marcelle Size Knack, *Post-World War II Bombers*, Office of Air Force History, 1988, p 3.[2] *Ibid*, p 5.[3] *Ibid*, p 7.[4] *Ibid*, p 5.[5] *Ibid*, p 11.[6] *Ibid*, p 19.[7] Aviation Week, 15 August 1949, p 13.[8] Aviation Week, 18 October 1948, p 13.[9] Convair report FZA-36-061, *Preliminary Proposal for Global Flight of the B-36 Airplane*, 6 January 1947.[10] *Ibid.*[7] SAC Manual 50-35, *Aircraft Performance Engineer's Manual for B-36 Aircraft Engine Operation*, 1953.[8] AN 01-5EUC-2 (1B-36D-2), *Erection and Maintenance Instructions, USAF Series B-36D Aircraft*, 3 June 1954.[9] SAC Manual 50-35.

WIDE BODY

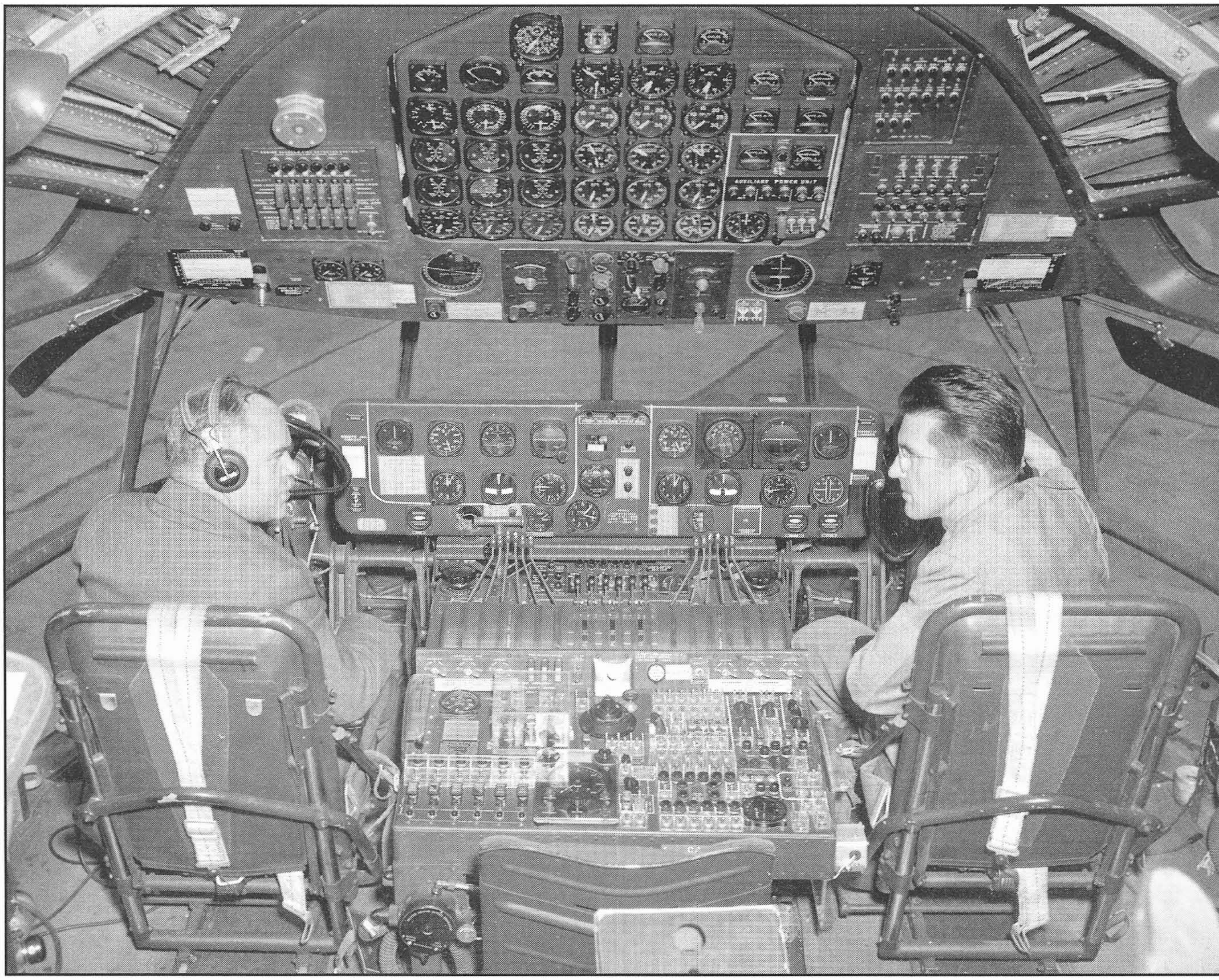
THE XC-99

As early as May 1942 Consolidated had investigated a cargo variant of the XB-36 that used the bomber's wing, tail, engines, and landing gear. The Army Air Forces finally ordered a single example (43-52436) on 31 December 1942 under a $4.6 million contract (W535-ac-34454) that specified the XC-99 project was not to interfere with the construction of delivery of the XB-36.[1] Interestingly, the fact that an entire new fuselage needed to be designed was not considered to be high risk, and Convair viewed the XC-99 as an easy and expeditious way of verifying several aspects of the B-36 design since no military equipment needed to be provided for the aircraft. The XC-99 would prove to be the largest piston-engine cargo aircraft ever developed.

The Model 37 which was eventually built as the XC-99 could carry over 100,000 pounds of cargo, 400 fully-equipped troops, or 300 litter patients. Total cargo volume was 16,000 cubic feet split between two decks. The aircraft's range was estimated to be 1,720 miles with a 100,000-pound load, or 8,100 miles with 10,000 pounds. Cruising speed was 292 mph, with a top speed of 335 mph at 30,000 feet. The fuselage was 20 feet high, 14 feet wide, and 182.5 feet long, and mockups were constructed at San Diego to optimize the cargo loading and unloading concepts. Eight crewmembers were required to operate the aircraft: pilot, copilot, two flight engineers, navigator, radio operator, and two scanners. The scanners were stationed on the lower deck in the aft section near windows to observe the operation of the engines and landing gear. The scanners doubled as cargomasters while the aircraft was on the ground.[2] The flight deck was carpeted and soundproofed, and fluorescent (black) lighting was provided at all crew stations for night flying.[3]

The aircraft had a design gross weight of 265,000 pounds, but the operating manual allowed an "over-condition" weight of 295,000 pounds with "favorable atmospheric conditions when operating from known runways." This allowed 117,000 pounds of cargo to be carried, and still permitted a normal 500-feet-per-minute rate of climb at sea level. Initially the aircraft was equipped with over 12,000 pounds of flight test instrumentation that

The XC-99 used the B-36's wings, engines, landing gear, horizontal stabilizer, rudder, and structural portions of the vertical stabilizer with a new wide-body fuselage. The goal was to create a testbed for B-36 systems that could also lead to future production as a cargo transport. Although the resultant aircraft provided valuable service for almost ten years, no others were ever manufactured. Here a B-36A (44-92013) is shown at San Diego while the XC-99 is being completed. (Convair via the San Diego Aerospace Museum)



The XC-99 used a unique flight deck arrangement. Most of the controls and instruments were placed such that the flight engineer did not need a dedicated station, and was seated at the rear of the large center console (the back of his seat can be seen in the lower center). Russell R. Rogers (Chief of Flight Test at San Diego) is on the right, and Robert R. Hoover (XC-99 Project Engineer) is on the left. (Convair via the Peter M. Bowers Collection)

provided detailed information on control movements and forces, engine and duct temperatures, duct velocities, and valve movements in the various systems.[4] In late 1950, the same landing gear modifications made to the B-36 fleet were incorporated, allowing a gross weight of 357,000 pounds.[5]

The airframe weighed 135,232 pounds: fuselage 25,164 pounds, wings 37,100, empennage 4,659, landing gear 18,738, engines and nacelles 42,345, and miscellaneous equipment 7,226. Aluminum and magnesium alloy accounted for 75,000 pounds, steel for 18,000, and glass for 2,000. The remainder was made up of rubber, plastic, fabric, and other metal alloys.[6]

To achieve maximum safety for crewmembers and passengers, Convair located the inboard fuel tanks some 10 feet outboard from the fuselage. A supplemental bulkhead between the inboard fuel tank and the fuselage served as a secondary dam in the event of fuel leakage and prevented entry of fuel into the fuselage, minimizing the fire hazard inherent with fuel tanks located in the fuselage area.[7] This essentially reduced the fuel capacity of the aircraft slightly from that carried by the B-36 since the smaller auxiliary fuel tanks normally located in the inboard section of the wing were deleted.

Even during the war Consolidated

pitched a commercial version[8] of the aircraft to several airlines. Pan American World Airways ordered 15 of the aircraft in February 1945, and production of the "Super Clippers" would begin as soon as the war ended. Each of the airliners could carry 204 passengers and 15,300 pounds of baggage and mail. Six 5,000-hp turboprop engines would be used, driving 19-foot three-bladed propellers. The interior arrangement featured a mixture of dayplane seats and sleeper berths, with spacious lounges located on each of the two decks, and large circular staircases located on each end of the aircraft. A full galley would offer gourmet meals, and the lavatory facilities resembled a fine hotel more than a modern airliner. But it was not to be, and the "wide body" era would have to wait another 20 years until the Boeing 747 was introduced.

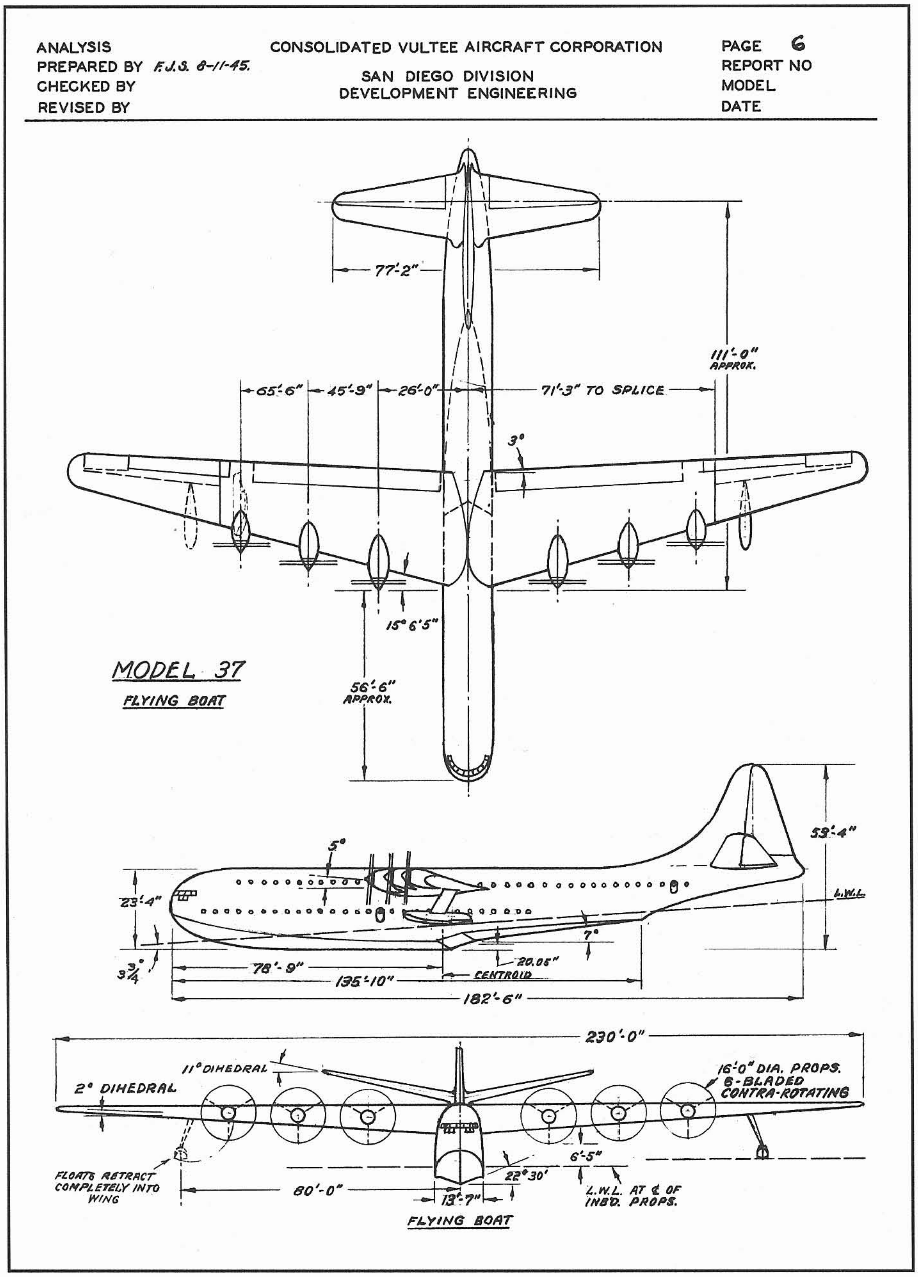
Pan Am also asked Convair to investigate a flying boat derivative of the huge aircraft.[9] The basic design of the aircraft was similar, except the six turboprop engines drove counter-rotating three-bladed 16-foot-diameter tractor propellers instead of the larger pushers. And of course the fuselage incorporated a hull design. The elimination of the landing gear and its supporting structure allowed a weight savings of 6,500 pounds, even after the modified hull and retractable wing floats were added. But the additional drag generated by the hull and floats meant the flying boat would need to carry 3,000 pounds more fuel to achieve the same nominal range. Nevertheless, this meant the flying boat could, in theory, carry 3,000 pounds more cargo. The design had a range of 4,200 miles at 25,000 feet and 332 mph – 10 mph slower than the conventional aircraft. Its maximum service ceiling was reduced from 30,000 feet to 29,100, and its takeoff distance increased from 4,760 feet (for the landplane) to 5,680 feet. It would take 48 seconds for the flying boat to clear the water after it started its takeoff run.

There appeared to be no reason a flying boat version of the Model 37 could not be developed. But the age of the flying boat was past, and Pan Am decided to concentrate on more conventional aircraft such as the Constellation and DC-7.

First Flight

The single XC-99 was built at the Consolidated factory in San Diego, although the wings and other common B-36 parts were manufactured in Fort Worth and shipped to San

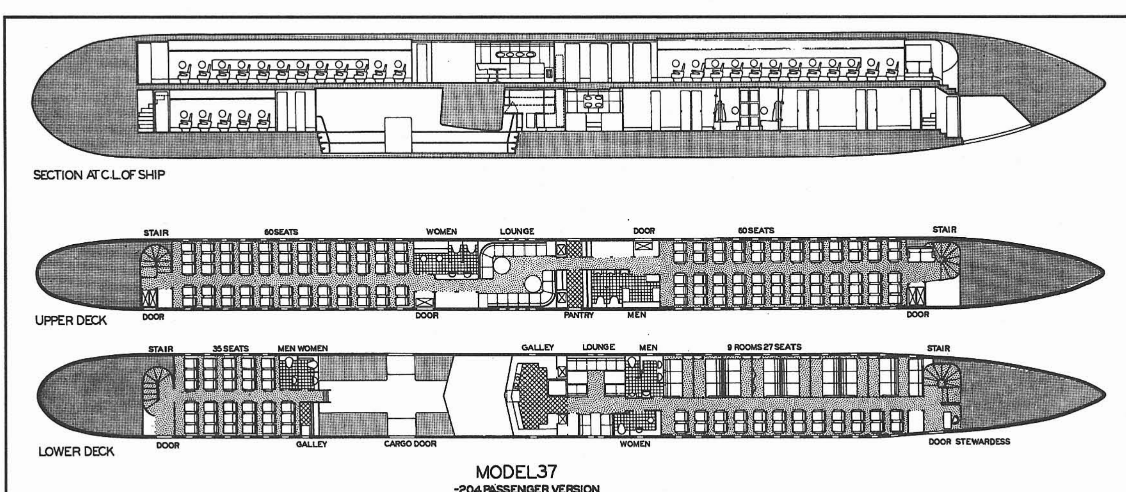
The lower aft cargo compartment had two observer stations so that crew members could monitor the engine and landing gear performance during takeoff and landing. The aft gunners performed a similar function in the B-36, in both cases mainly because the pilots had no direct visibility.
(Convair via the San Diego Aerospace Museum)



Pan American World Airways asked Convair to investigate a flying boat variant of the XC-99 for possible use after World War II. Pan Am had a great deal of experience flying long over-water routes using flying boats such as the Boeing 314 "Clippers," but was finally convinced that the future was in landplanes. The flying boat XC-99 was never built, and Pan Am went on to order the Lockheed Constellation and Douglas DC-7. (Convair via the San Diego Aerospace Museum)

Diego for installation. On 23 November 1947 the XC-99 made its maiden flight with Russell R. Rogers and Beryl A. Erickson at the controls.[10] The aircraft used the same 110-inch-diameter single main wheels as the XB-36, but these could be tolerated by the runway at Lindberg Field as long as the aircraft was lightly loaded. The four-wheel main gear was retrofitted, and the XC-99 first flew with it on 24 January 1949. Initially the aircraft was fitted with –25 engines, but in early 1950 was fitted with –41 engines for commonality with the B-36 fleet.

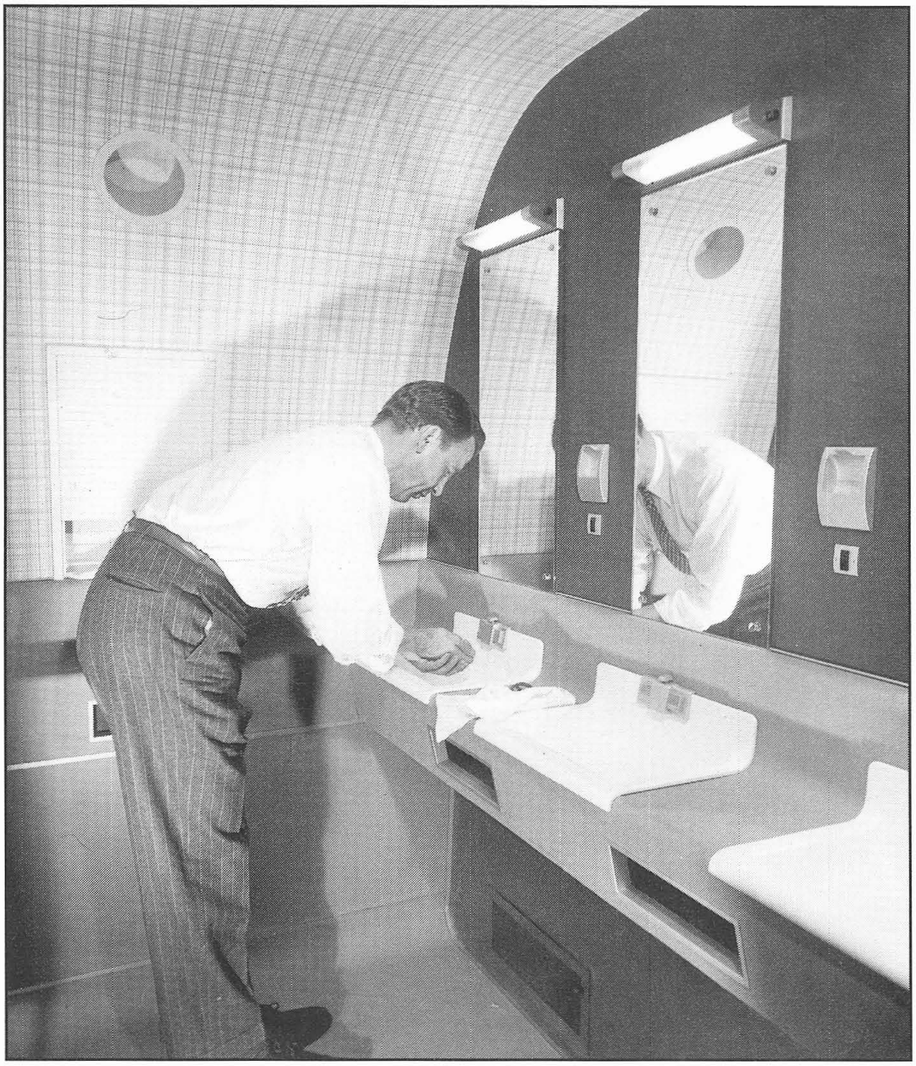
Like the B-36s, the XC-99 used unpowered flight controls. The control surfaces had an area almost



The interior layout of the landplane version of the Model 37 for Pan Am. (Convair via the San Diego Aerospace Museum)

equal to the entire wing area of a B-24, and were operated by a series of spring tabs that used air pressure to deflect the control surface. The spring tabs, looking much like normal trim tabs only larger, were directly operated by moving the control sticks in the cockpit, and caused the larger control surface to move via aerodynamic forces. The use of spring tabs was not original to the B-36/XC-99, but it was the largest aircraft ever equipped with the devices. Also like the early B-36s, the XC-99 used aluminum skin for the elevators, but doped fabric for the ailerons and rudder. Unlike the B-36, most of the XC-99 fuselage was of conventional aluminum construction, with magnesium used only for the tail cone and parts of the cargo doors.[11]

The XC-99 was equipped with two electrically-operated sliding cargo doors on the bottom of the fuselage, one just forward of the wing and one in the aft fuselage. The doors were supported by rollers that moved in tracks, and the fuselage skin had slots to accommodate the door brackets while they



Convair built a complete set of mockups for Pan Am's Model 37 "Super Clippers" in the closing days of World War II. The interior reflected the attitude of air travel that had existed prior to the war – that it should be luxurious and mimic the large ocean liners in the level of service. This is obviously reflected in the size and furnishings of the lavatories (top) and lounge. Note the lack of windows in the lounge – Convair was unsure how many windows could be installed in a pressurized fuselage without compromising its structural integrity. (Convair via the San Diego Aerospace Museum)

Built-in hoists allowed cargo to be loaded onto either deck of the XC-99 via large hatches in the bottom of the fuselage. Alternately, ramps could be installed that allowed some items to be driven up onto the lower decks. (Convair)

moved. The slots were covered flush by spring-loaded strips when the doors were closed. Two pairs of clamshell doors were installed immediately aft of the rear sliding cargo door although the rear sliding door had to be opened before them. Structural limitation prohibited the clamshell doors from being opened in flight, although either sliding door could be opened in order to drop cargo. Either cargo opening could be fitted with angled ramps that permitted vehicles to be driven onto the lower level.

There were two cargo compartments on the lower deck, separated by the wing carry-through structure, and a single long compartment on the upper deck.

Cargo could be loaded, unloaded, or shifted within the cargo compartments by means of four electric hoists. The hoist in each of the lower compartments could be used to shift or drop cargo while the aircraft was in flight, but the two hoists in the upper compartment were normally restricted to ground operations. The hoists were set on tracks located in the ceiling of each compartment and could traverse the entire length of their compartment. Each hoist could lift up to 4,000 pounds single purchase, or 8,000 pounds double purchase. The lower decks were equipped with winches attached to the cargo floor to pull items up the ramps.[12]

The upper cargo compartment was accessed via two openings in its floor, one directly above the forward sliding door, and the other directly above the aft-most clamshell door. There was also a ladder at the front and rear of the fuselage to allow personnel access to the upper compartment. Heat exchangers used waste engine heat to provide comfort air to the cargo compartments and flight deck. These heat exchangers could provide up to 4,800,000 BTUs per hour, enough to heat a 600-room hotel, yet the equipment weighed only 1,530 pounds.[13]

The flight deck was equipped with five canvas bunks, two of which could be reconfigured to provide "jump-type" seats along one of the outside walls. A toilet and drinking water supply were also provided, but no galley was fitted. Provisions were made for five additional toilets (two on the upper deck and three on the lower deck) when the aircraft was outfitted as a troop carrier. Troop seating was on canvas benches along each side of the fuselage on both decks.

The XC-99 was officially delivered to the Air Force on 26 May 1949 and was used extensively by the San Antonio Air Materiel Depot at Kelly AFB, Texas. In June 1950 the XC-99 made several 1,150-mile flights carrying B-36 parts from Kelly AFB to San Diego as part of Operation ELEPHANT. On 14 July, a return trip from San Diego to Kelly included ten R-4360 engines and 16 propellers, as well as other material. The total payload was 101,266 pounds, and the

aircraft had a ramp weight of 303,334 pounds. During the flight, the No. 6 engine began backfiring and was shut down – the flight was completed on five engines!

During January 1952 the aircraft flew 15 cargo flights totaling 117.25 hours carrying 1,123,000 pounds of cargo. It took an average of 54 minutes to load each 10,000 pounds of cargo with a ten-man loading crew. Offloading averaged just over half as long. The totals for a nine-month period around the same time were also impressive: 7,000,000 pounds of cargo during 115 flights, 65 of which were over 1,500 miles.[14]

The XC-99 continued to provide useful service to the San Antonio depot, and flew more flight hours than any other Air Force experimental aircraft. By June 1957 it was obvious that some structural fatigue was occurring, and the Air Force did not want to spend the estimated $1,000,000 to fix it. The XC-99 was permanently grounded. A few months later, title for the aircraft was transferred to the Disabled American Veterans, who put the aircraft on public display for the next 30 years. The aircraft fell into disrepair, and in 1993 the Kelly Field Heritage Foundation purchased it for $65,000 and donated it to the Air Force Museum. It currently sits on the ramp at the former Kelly AFB, its future p uncertain.

By December 1949 Convair had designed a definitive production version of the C-99. The most visible change was the raised "bubble" cockpit common with the pro-

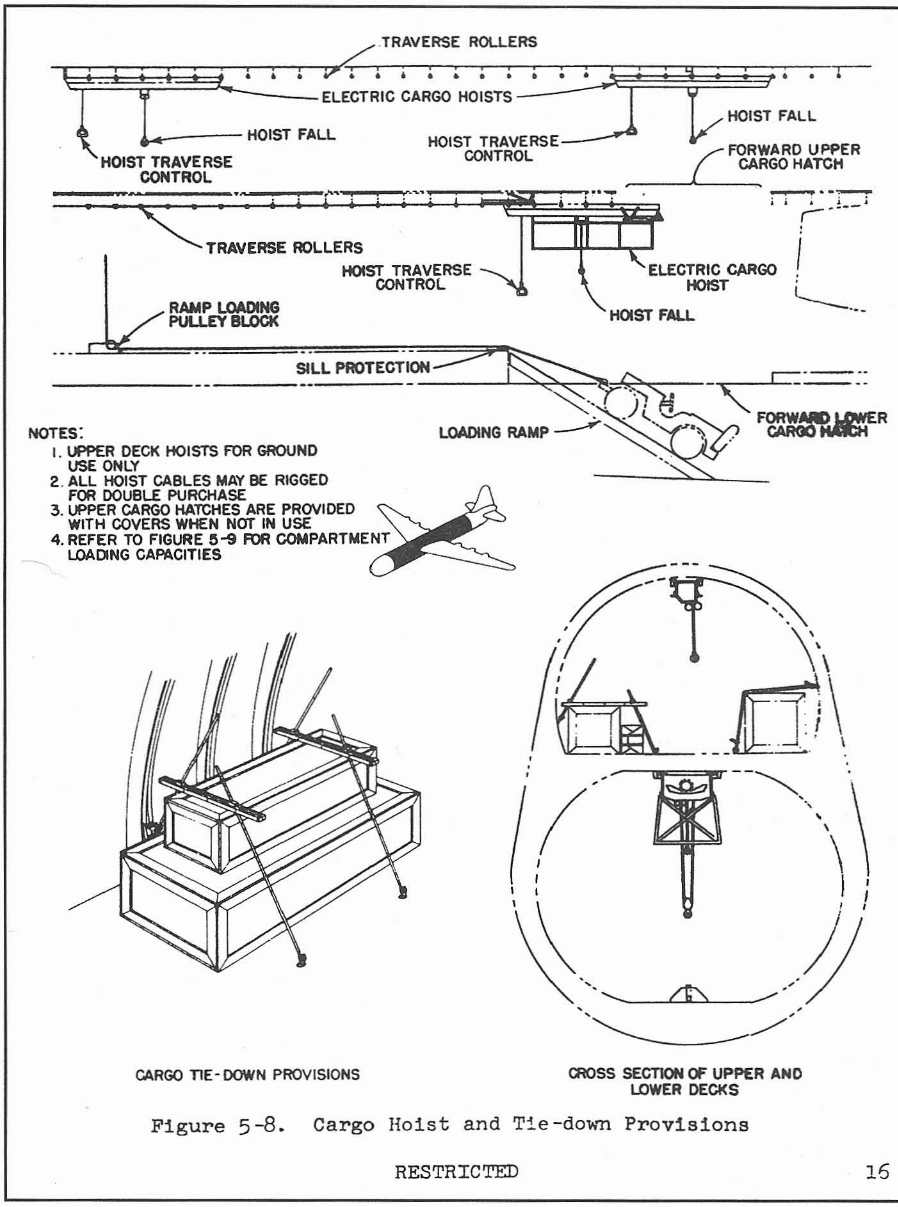
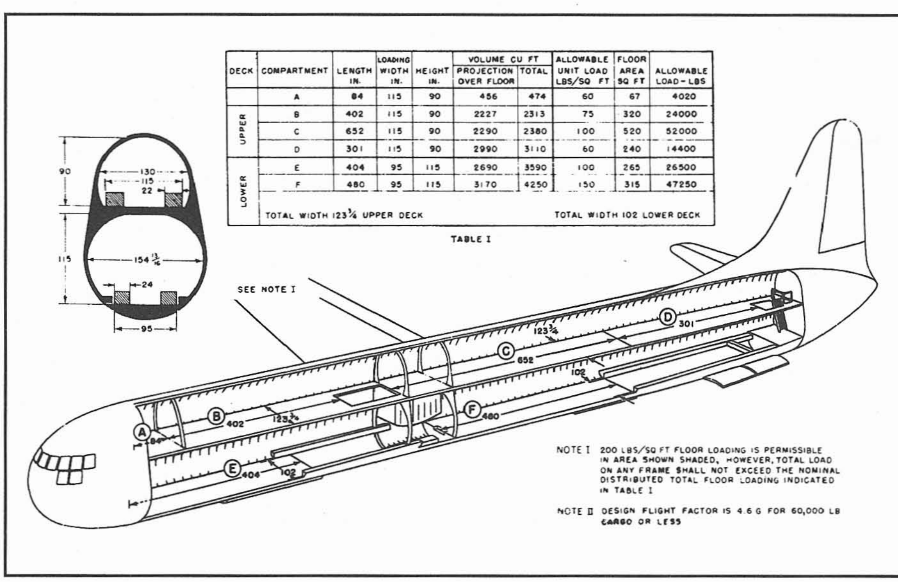


Figure 5-8. Cargo Hoist and Tie-down Provisions

RESTRICTED 16

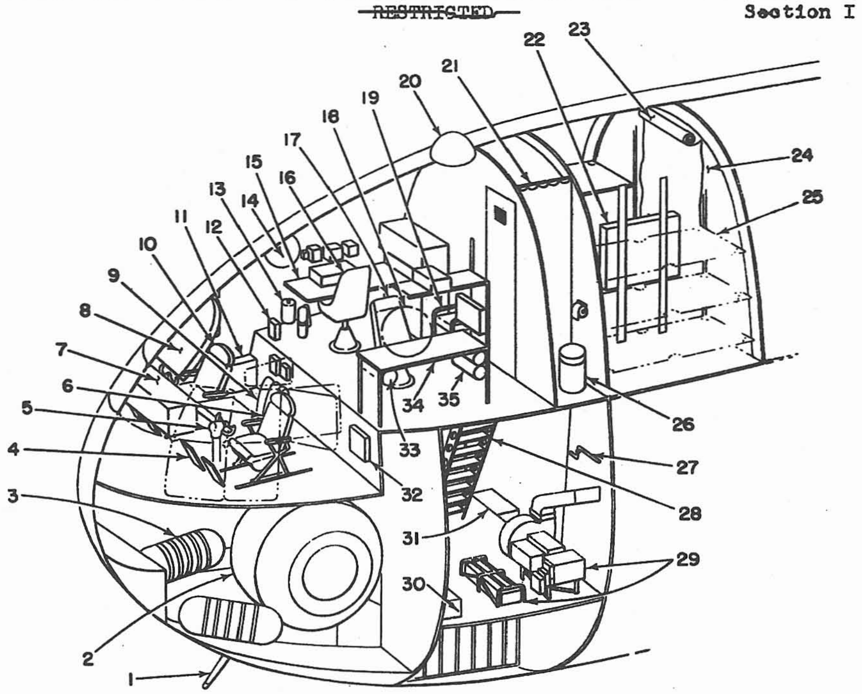


DECK	COMPARTMENT	LENGTH IN.	LOADING WIDTH IN.	HEIGHT IN.	VOLUME CU FT PROJECTION OVER FLOOR	VOLUME CU FT TOTAL	ALLOWABLE UNIT LOAD LBS/SQ FT	FLOOR AREA SQ FT	ALLOWABLE LOAD-LBS
	A	84	115	90	456	474	60	67	4020
UPPER	B	402	115	90	2227	2313	75	320	24000
UPPER	C	652	115	90	2290	2380	100	520	52000
UPPER	D	301	115	90	2990	3110	60	240	14400
LOWER	E	404	95	115	2690	3590	100	265	26500
LOWER	F	480	95	115	3170	4250	150	315	47250
LOWER	TOTAL WIDTH 123¾ UPPER DECK						TOTAL WIDTH 102 LOWER DECK		

TABLE I

Cargo loading and hoisting diagrams from the XC-99 Flight Handbook. (U.S. Air Force)

RESTRICTED Section I



1. Antenna (Ref)
2. Nose Landing Gear Wheel (Ref)
3. Oxygen Cylinder (2)
4. Pilot's Rudder Pedals (Ref)
5. Control Column (Ref)
6. Pilot's Seat
7. Flight Instrument Panel
8. Overhead Board
9. Flight Engineer's Seat
10. Copilot's Seat
11. Flight Test Instrumentation (Ref)
12. Emergency Hydraulic Fluid Can
13. Emergency Hydraulic Reservoir (Ref)
14. Radio Operator's Window (Ref)
15. Radio Operator's Table
16. Radio Operator's Seat
17. Navigator's Seat
18. Navigator's Window (Ref)
19. Astrodome Stand
20. Astrodome
21. Curtain
22. Flight Test Installation Junction Box (Ref)
23. Crew Quarters Curtain
24. Curtained Bulkhead
25. Crew Bunks
26. Toilet Installation
27. Auxiliary Power Unit Crank
28. Forward Stairway
29. Auxiliary Power Unit and Control Box
30. Battery Box (Ref)
31. Radio Equipment Box (Ref)
32. Data Case
33. Map Case
34. Navigator's Table
35. Drinking Water Tanks

Figure 1-2. Nose Section General Arrangement

RESTRICTED 4

The flight deck of the XC-99 was arranged on two levels, with the two pilots and flight engineer in the lower frontmost level, while the navigator and radio operator occupied the upper level behind them. Bunks were located in a separate compartment behind the lavatory. (U.S. Air Force)

duction B-36. This included the same basic flight deck used on the B-36B. A new nose landing gear was located in a bulge located under the forward fuselage, looking much like the radome under the B-36. The new arrangement did not protrude into the cargo area, and its slightly longer stroke allowed a level floor (the XC-99 had a slight forward slope).[15]

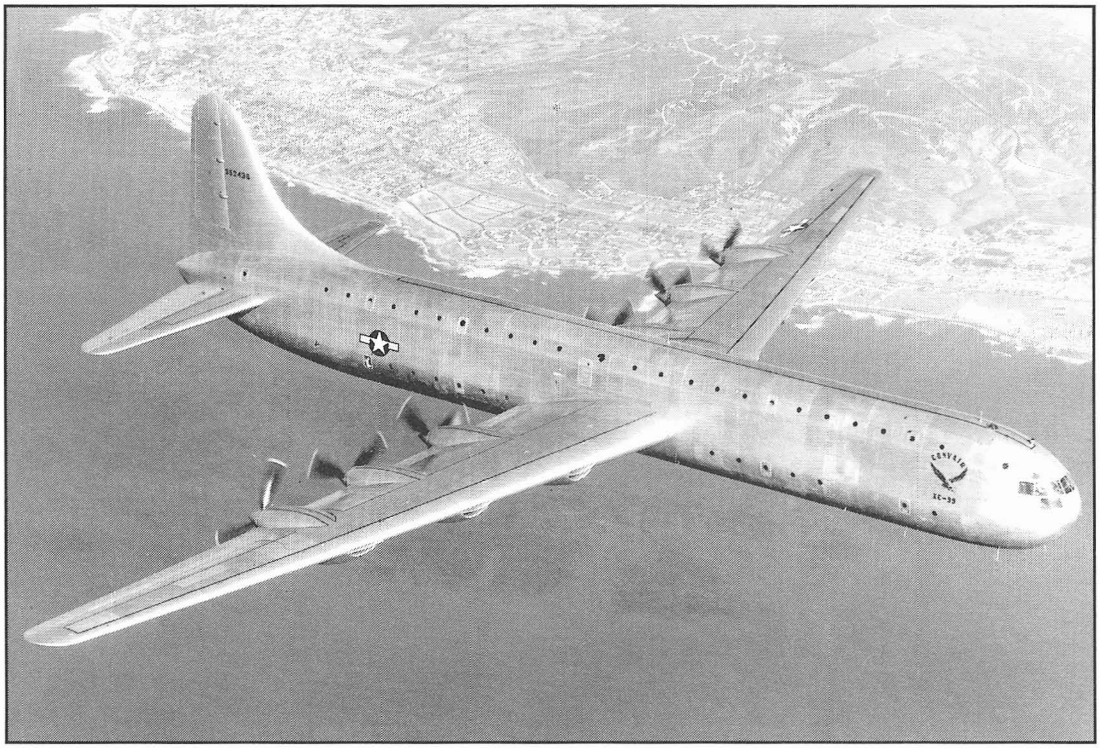
A revised fuselage featured a rearranged cargo area with a pressurized upper deck that could accommodate 183 troops. The lower compartment remained unpressurized, but now featured large clamshell doors in the nose and tail that allowed vehicles to drive on and off at the same time. The doors provided an entrance measuring 12x13 feet and could accommodate the Army's 240 mm howitzer and M46 heavy tank. The C-99 was designed to allow vehicles or tanks to be transported with their operating and maintenance crews directly to a combat area without the need for a staging area, a capability not realized until the advent of the Lockheed C-5A Galaxy.

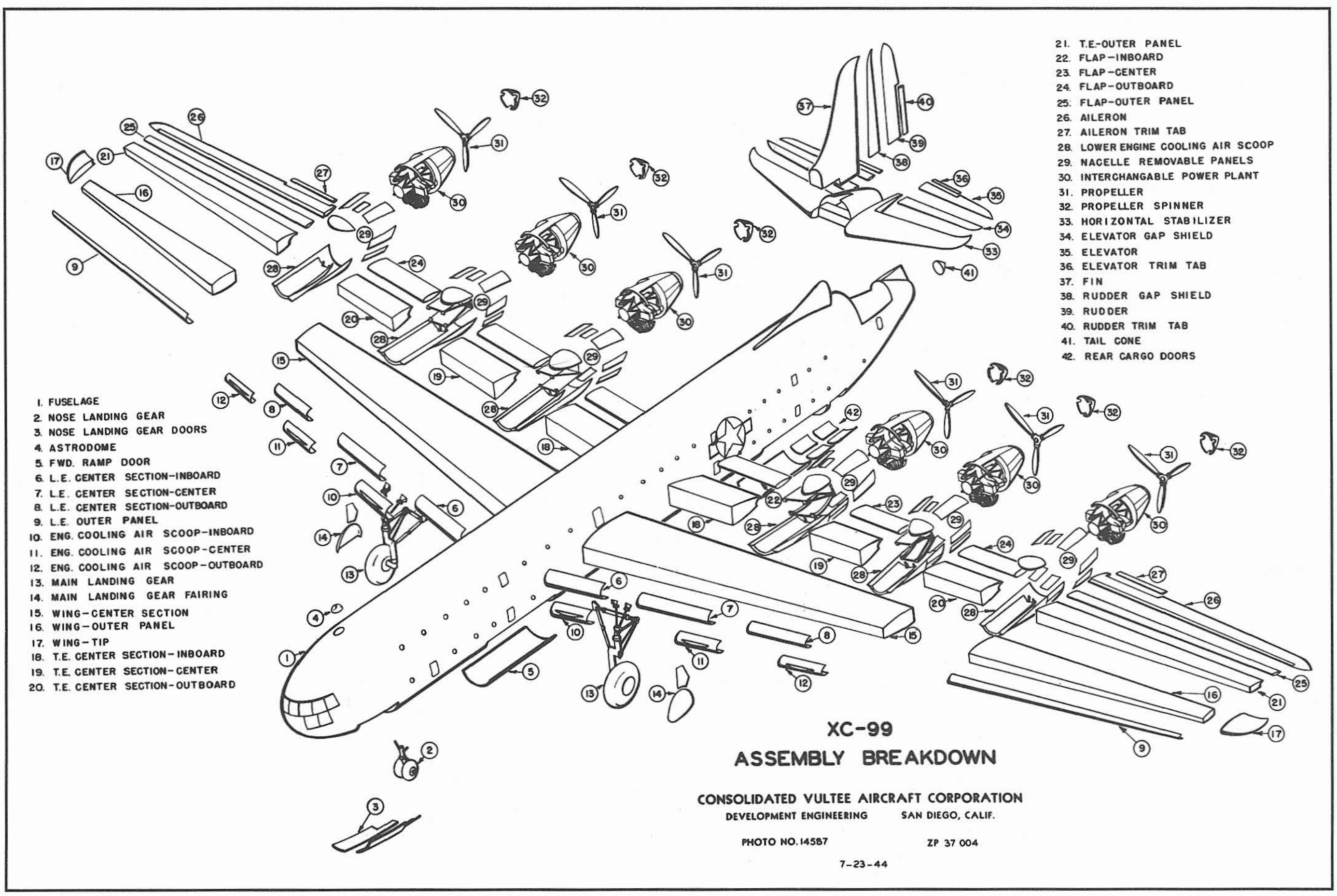
The C-99 had 21,714 cubic feet of available cargo space, compared to the 16,000 cubic feet available on the XC-99. The Fort Worth-based design team believed that 100,000 pounds could be transported 3,800 miles, with an overload capability of 116,000 pounds over a somewhat shorter distance. If necessary the aircraft could carry 401 fully-equipped troops (unpressurized) or 343 litters and 33 medical attendants. The aircraft shared the 230-foot wingspan of the standard B-36, but was 182 feet long and 57 feet high at the vertical stabilizer. The maximum gross takeoff weight was 357,000 pounds. Alternate designs were also prepared using the VDT engines proposed for the B-36C, and also using the track-style landing gear tested on the YB-36.

But for reasons that are not readily apparent, the Air Force decided against procuring the C-99. Instead it bought large numbers of the Boeing C/KC-97 (a B-50 variant) and Douglas C-124 and C-133 transports.

[1] Marcelle Size Knack, *Post-World War II Bombers*, Office of Air Force History, 1988, p 8. [2] Aviation Week, 2 June 1952, p 12. [3] Convair XC-99 Press Book, undated, p 18. [4] Flight Operating Instructions for the XC-99 Airplane, 31 March 1949. [5] Convair Field Service Letter No. 56, 11 June 1951. [6] Convair XC-99 Press Book, undated, p 30. [7] *Ibid*, p 26. [8] Convair report ZD-37-004, *CVAC Model 37 for Pan American Airways*, 15 February 1945. [9] Convair report ZH-026, *A Comparison of Performance Between the Model 37 and a Flying Boat Version of the Same Airplane*, 17 August 1945. [10] Convair XC-99 Press Book, undated, p 1. [11] *Ibid*, p 11. [12] *Ibid*, p 20. [13] *Ibid*, p 28. [14] Aviation Week, 2 June 1952, p 12. [15] Aviation Week, 5 December 1949, p 14.

The lack of bumps on the inboard upper wing surfaces indicates this photo was taken while the XC-99 still had the original 110-inch main landing gear. Note the "Convair XC-99" emblem on the forward fuselage, and the lack of "SAAMA" markings on the tail. (Convair via the Terry Panopalis Collection)





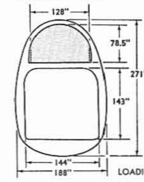
Most of the XC-99 components other than the fuselage itself were common to the B-36, and were manufactured in Fort Worth and shipped to San Diego for final assembly. (Convair)

Inboard Profile

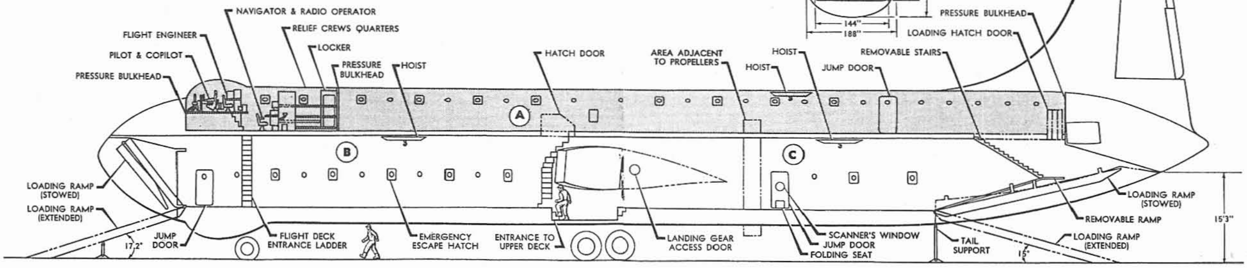
PRESSURIZED AREA

COMPARTMENT AND DECK	LENGTH MAX. IN.	WIDTH MAX. IN.	HEIGHT INCHES	VOLUME (CU. FT.) PROJECTION ABOVE FLOOR	VOLUME (CU. FT.) TOTAL	FLOOR AREA SQ. FT.	MAX. LOAD LBS./SQ. FT.
A UPPER	1320	131	78.5	5795	5800	1075	100
B LOWER FWD.	740	154	143	8420	9000	740	165
C LOWER AFT.	660	154	143	7500	8000	660	165
TOTAL					22,800	2475	

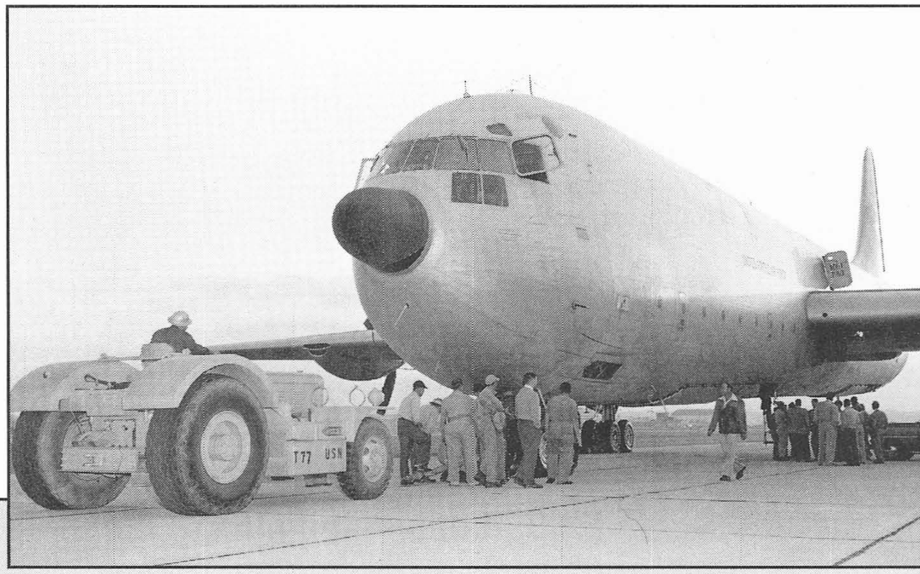
TYPICAL SECTION



As all forms of transport have developed, the size of the carrier has continually increased. Now, the C-99 makes possible the air carriage of cargo loads almost double anything previously known. The resulting economic and military advantage is obvious and tremendous.



Interior arrangement of the proposed production C-99 military transport. (Convair via LMTAS/Mike Moore)



The weather radar changed the whole character of the XC-99's nose, although the actual change was relatively minor. Note the large opening side windows on the flight deck. (U.S. Air Force via the San Diego Aerospace Museum)

Late in its operational service, the XC-99 was fitted with weather radar on the nose, and the top of the crew compartment was painted white as a measure of protection against the Texas sun. Photographed 15 May 1953. (A. Kreiger via the Norm Taylor Collection via Richard Freeman)

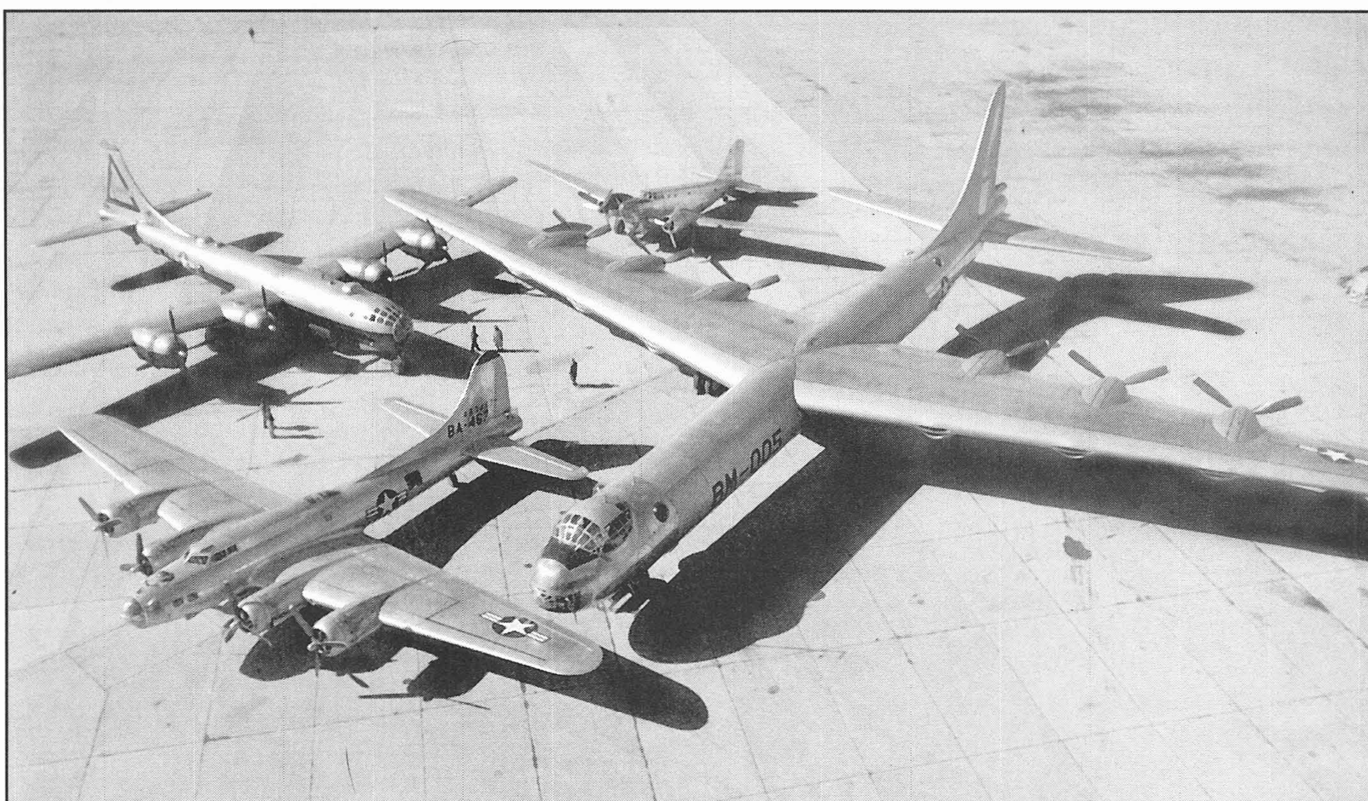
INITIAL PRODUCTION

B-36A, B-36B, AND THE ABORTIVE B-36C

The B-36A was essentially similar to the preceding YB-36, including the use of 3,000-hp R-4360-25 Wasp Major engines. The first aircraft (44-92004) made its maiden flight on 28 August 1947, actually beating the YB-36 into the air by almost four months. This aircraft was reportedly designated YB-36A, and was only fitted with enough equipment for a single flight to Wright Field where it was used as a structural loads airframe and tested to destruction. The aircraft was flown to Wright Field simply because nobody could figure out another method of getting it there. The aircraft accumulated a total of 7 hours and 36 minutes of flight time in its two flights (it had flown once at Fort Worth just to prove it was airworthy).

The planned APG-7 bombing/navigation system had been superceded by a better packaged APQ-23 with a radome located beneath the forward fuselage where the lower gun turrets were originally going to be located. The complex General Electric defensive armament system was not fully developed and was not installed on any of the B-36As. The normal crew complement was listed as 15, but this included eight gunners who had no guns. The other seven crew members were a pilot, copilot, radar-bombardier, navigator, flight engineer, and two radiomen.

On 13-14 May 1948, a single B-36A (44-92013) conducted a simulated long-range tactical mission. The aircraft had a gross weight of 299,619 pounds, including 10,000 pounds of simulated bombs, 5,796 pounds of simulated 20-mm ammunition, and ballast to compensate for the lack of turrets and other items of equipment not fitted to the B-36As. The flight duration was 36 hours and 8 minutes during which 8,062



The Air Force and Convair took great delight in showing how large the B-36 was. Here a B-36A poses with a B-17, B-29, and B-23 on the ramp at Fort Worth. (Convair via LMTAS/Mike Moore)

The height of the B-36 vertical stabilizer was greater than the height of the plant door. The solution – raise the nose of the aircraft in order to lower the tail, then tow it outside. This is a red-tailed B-36B. (Convair)

miles were flown at an average 223 mph. The aircraft landed with 986 gallons of fuel remaining, which could have extended the mission by 508 miles.[1]

Nineteen B-36As were delivered to the 7th Bombardment Group (Heavy) based at Carswell AFB, located just across the field from the Convair factory at Fort Worth. On 18 June 1948 one was delivered to Eglin AFB for climatic testing, which lasted most of the following year. The first delivery to SAC was on 26 June 1948, and the last B-36A was accepted in February 1949.[2]

As built (without defensive armament) the B-36As had a ramp weight of 310,380 pounds when loaded with 24,121 gallons of fuel and 10,000 pounds of bombs. They required a takeoff run of 8,000 feet, and had a realistic radius of action of 3,880 miles (i.e., they could hit a target 3,880 miles away, and return). Over the target they had a maximum speed of 345 mph at 31,600 feet, and a service ceiling of 39,100 feet – not quite up to the original specification, but still impressive for 1948.

But they could carry bombs. On 30 June 1948, a B-36A dropped 72,000 pounds of bombs during a test flight, the heaviest bomb load yet carried by any bomber.[3] The four bomb bays were covered by magnesium doors that slid up the outside of the fuselage when opened, much like those used on the B-24. The doors were slow to operate, tended to stick in the extremely cold temperatures at 40,000 feet, and significantly increased drag when open. A better solution would need to be found.

The B-36A suffered from many of the types of problems normally encountered when a complex new aircraft enters service. The fuel tanks leaked, the electrical system was troublesome, and engine cooling was still not as good as it should have been. None of the problems were insurmountable, and Convair engineers continued to work on solutions. Nevertheless, the service life of the B-36A was extremely short, and all of them had been converted to the RB-36E configuration by July 1951.

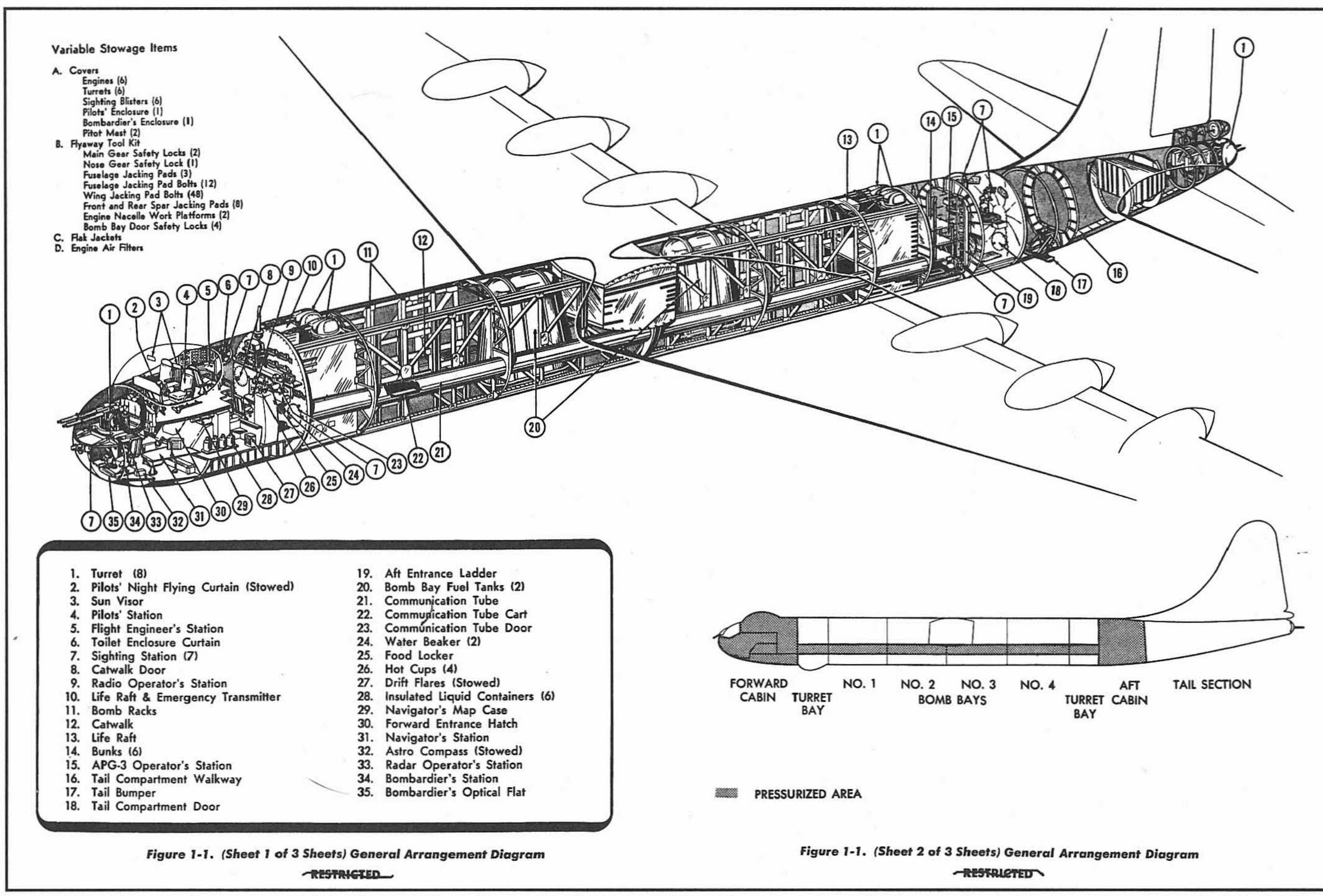
B-36B

The B-36B used uprated 3,500-hp R-4360-41 engines with water injection, allowing slightly shorter takeoff distances, and yielding marginally higher cruising speeds and a higher top speed. The first B-36B made its maiden flight on 8 July 1948 with Beryl Erickson at the controls, and subsequent testing showed that its performance was generally better than expected. An average cruising speed of 300 mph could be maintained at 40,000 feet, and the aircraft could carry up to 86,000 pounds of bombs, a rather significant 14,000 pound increase over the B-36A. It appears that at least the first few B-36Bs were also equipped with the mounting brackets to carry the F-85 parasite fighter, although it is unlikely any equipment was actually installed.[4]

The B-36B used an AN/APQ-24 bombing/navigation system with an improved search radar and faster computer. In addition, the defensive armament was installed, making it the first true combat version of the B-36. The sixteen 20-mm cannon were installed in six retractable remotely-operated turrets each equipped with a pair of cannon, plus two more pairs in nose and tail turrets. This was the most formidable defensive armament yet fitted to any warplane. The guns were aimed using computing gunsights situated at two blisters on the forward fuselage and four blisters on the aft fuselage. The tail turret was directed by an AN/APG-3 gun-laying radar.

Like the B-36A, the crew of the B-36B was normally fifteen, a pilot, copilot, radar-bombardier, navigator, flight engineer, two radiomen, three forward gunners, and five rear gunners. In this case the gunners actually had something to do.

Beginning in late November 1948 B-36Bs were assigned to the 7th BG(H) at Carswell AFB, which already operated the B-36As in a training role.[5] The 11th BG(H) would also be activated at Carswell with the B-36B. However, the Cold War dictated that bases closer to the Soviet Union be found in order to shorten the response time and allow deeper penetration. As part of Project GEM, the 7th BG(H)

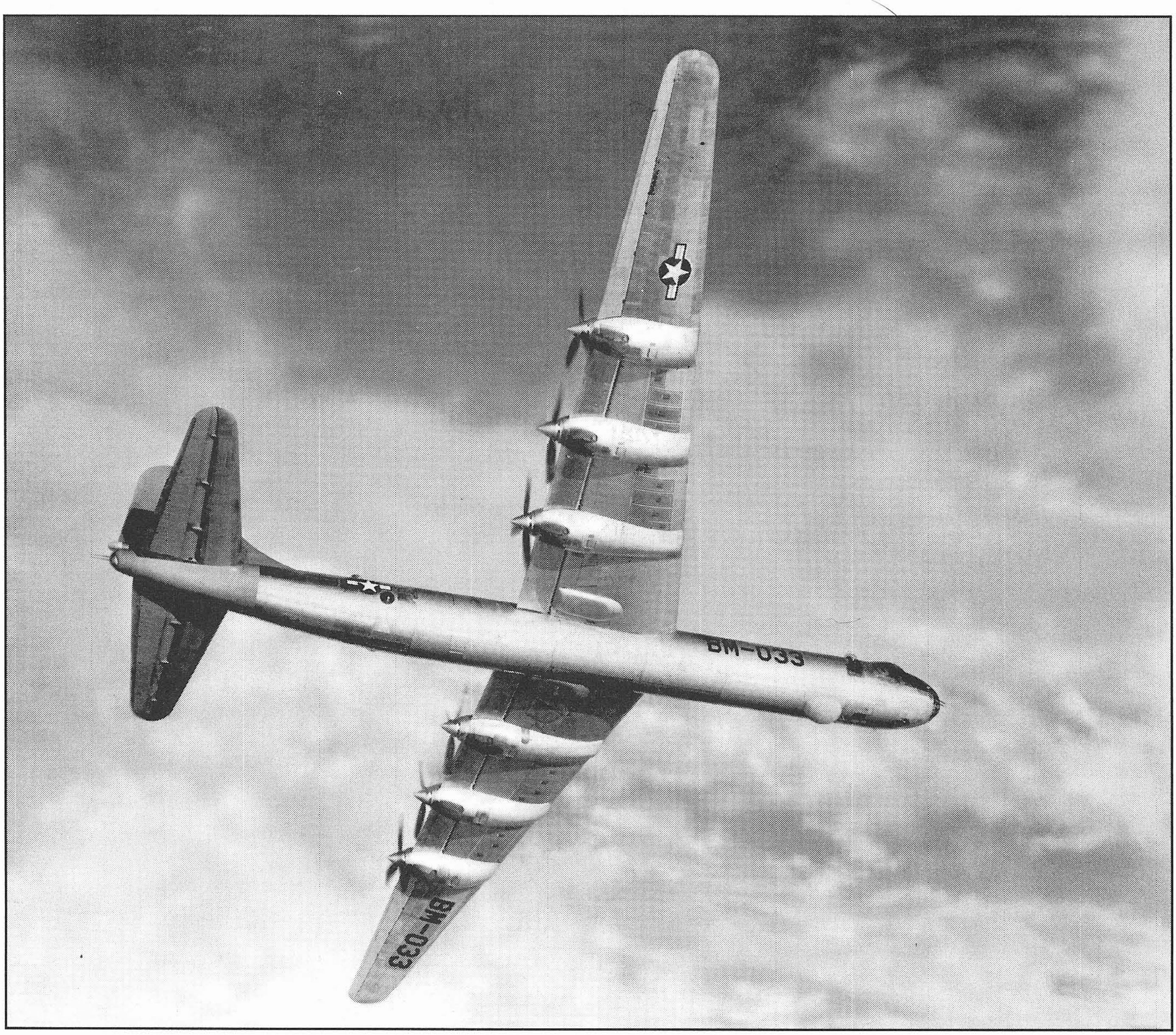


The General Arrangement diagram from the B-36B flight manual. (U.S. Air Force)

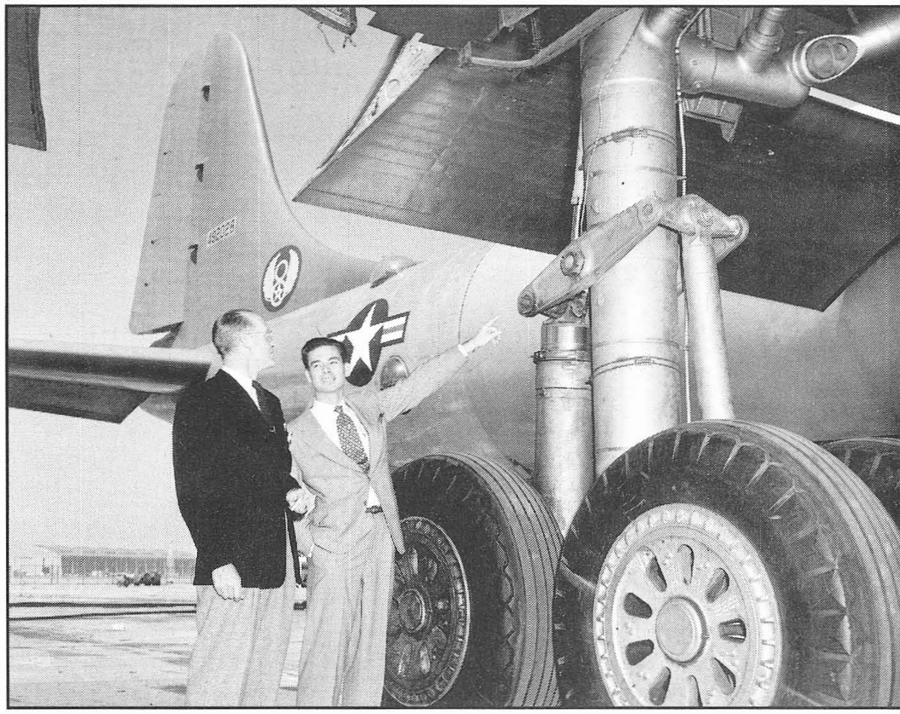
assigned 18 B-36Bs to bases near Goose Bay, Labrador; Limestone, Maine; and Fairbanks, Alaska. These aircraft had their tails and wingtips painted bright red in case they were forced down in the rough terrain (day-glo paint had not been perfected yet).

In a maximum range demonstration, a B-36B from the 7th BG(H) flew a 35-hour round-trip simulated bombing mission from Carswell to Hawaii on 7-8 December 1948. A 10,000 pound load of dummy bombs was dropped in the ocean a short distance from Hawaii. The flight covered over 8,100 miles, although the average cruising speed was only 236 mph. Nevertheless, this proved the B-36 was a true intercontinental bomber and, given the right circumstance, could attack almost any target in the world. Interestingly, the B-36 penetrated Hawaiian airspace without being detected by the defensive forces on the islands, an embarrassment they did not appreciate, coming seven years to the day after Pearl Harbor.

More demonstrations followed. On 29 June 1948, a B-36B established a record bomb lift by taking a pair of dummy 43,000-pound Grand Slam bombs aloft at Muroc AFB (now



The bulges on the landing gear doors to cover the four-wheel bogies were very prominent. The radome under the forward fuselage housed the AN/APS-23 search radar used by the bomb/nav system. Many of the early B-36s had their tails painted red while they operated in the Arctic region. (Convair via the San Diego Aerospace Museum)

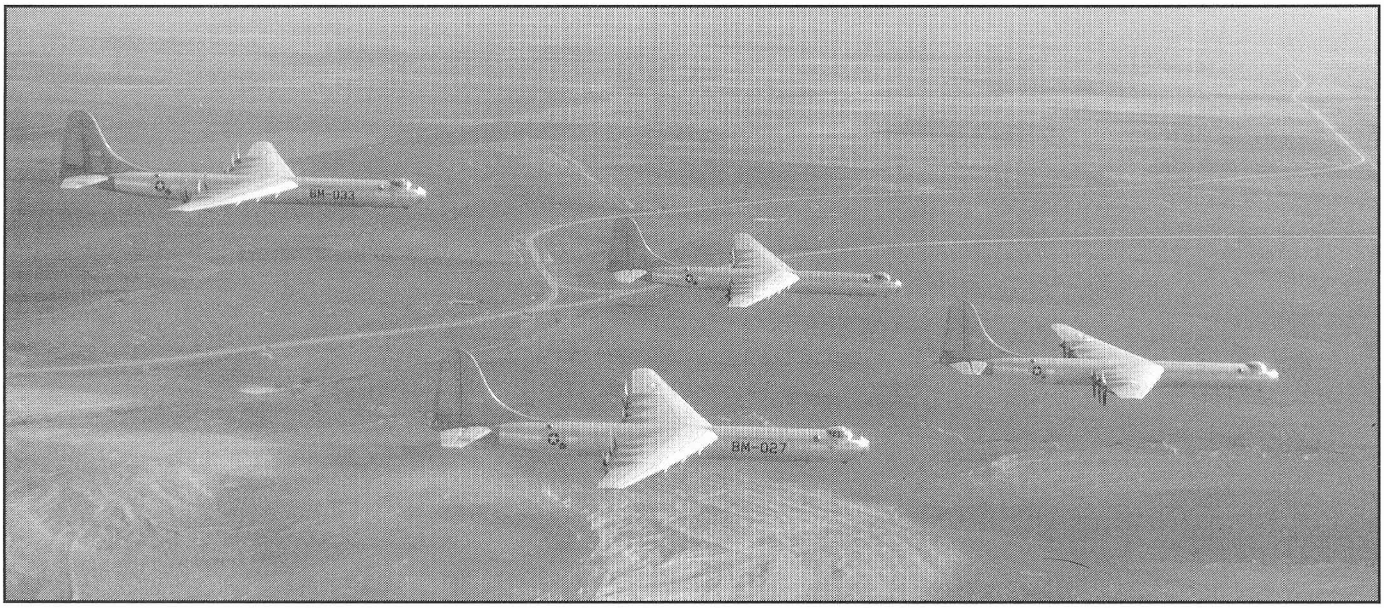


Even the 56-inch tires on the revised main landing gear were large. Note the deployed flap – the B-36 flaps were multi-segmented due to the placement of the pusher engines. (San Diego Aerospace Museum Collection)

Edwards AFB). The first was released at an altitude of 35,000 feet, the second from 41,000 feet, and the entire flight covered 3,100 miles. In March 1949, a B-36B established a distance record of 9,600 miles flown in 43 hours 37 minutes, with enough fuel remaining for two more hours of flying. The B-36 had been carrying a simulated load of 10,000 pounds, and encountered severe headwinds over the Rocky Mountains. A 10,000-mile mission was undoubtedly possible under ideal conditions.[6] And remember, this was before in-flight refueling – the B-36 could remain aloft for nearly two days, totally self sufficient.

Still, everything was not working as well as it could be. The APQ-24 was neither as reliable nor as accurate in service as it had been during testing. The problem was eventually traced to faulty vacuum tubes and inadequate crew training. The complex General Electric remotely-controlled turrets were prone to frequent failures. Although conceptually similar to the defensive armament installed on the B-29, the sys-

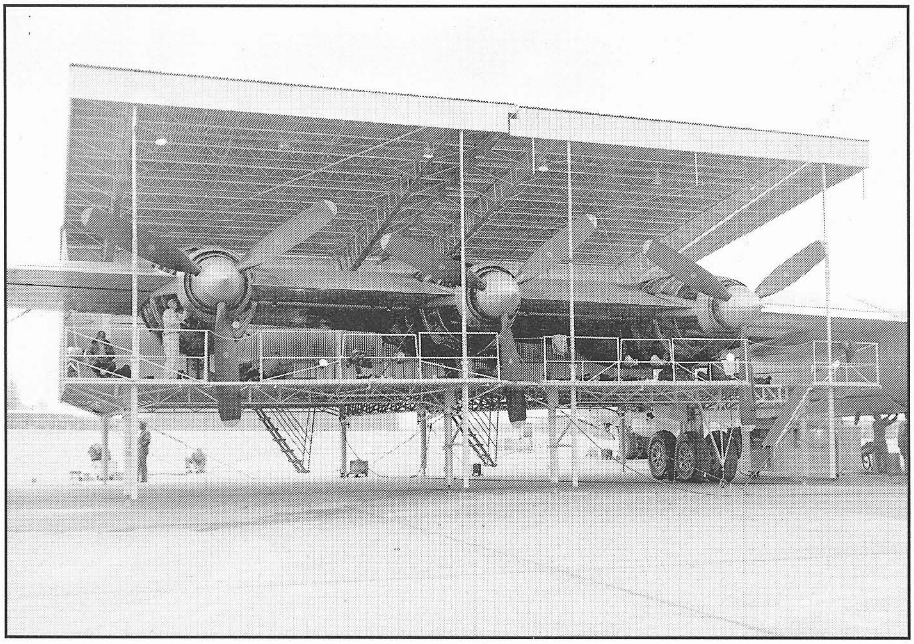
Since there were no maintenance hangers that could accommodate the B-36, most maintenance was performed outside using work stands. This presented problems in extreme climates. (Norm Taylor Collection via Richard Freeman)



Anyone who ever heard a formation of B-36s pass overhead will never forget the thunder from the R-4360 engines. Unlike later bombers that frequently traveled alone, the B-36 still relied on formation tactics, usually involving between three and nine aircraft. (Convair via LMTAS/Mike Moore)

tem was much more complex, a necessity to ensure it was capable of handling the ever increasing speeds of the fighters it was designed to shoot down. The extreme cold at 40,000 feet created problems. The APG-3 gun-laying radar for the tail turret also proved to be remarkably troublesome. As late as February of 1950, the commander of the 8th Air Force was complaining that "... there was little point in driving a B-36 around carrying a lot of guns that didn't work."

Many of the B-36B's initial problems resembled those of any other new and complex aircraft. Parts shortages were acute, and it was often necessary to cannibalize some B-36Bs to keep others flying. The problems seemed larger than normal, but the B-36 was a larger than normal aircraft. Equipment such as empennage stands, dollies, and jacks were in short supply. Because there was no funding for new equipment, maintenance crews utilized some of the tools and equipment left over from the old B-29s. Personnel turnover in the postwar environment further hampered progress. The aircraft were con-



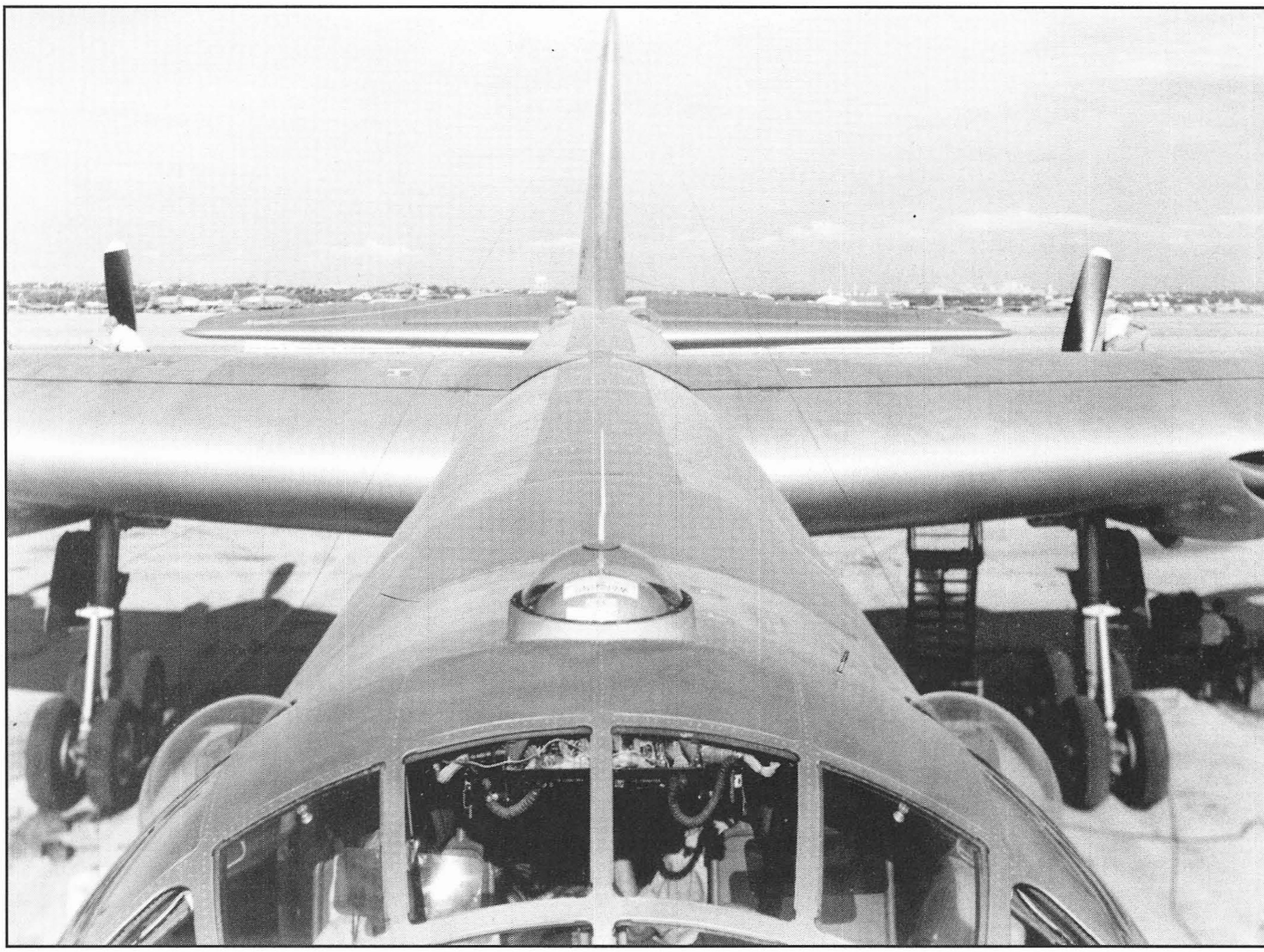
Part of the maintenance problem was corrected with portable docks. This is a rear view of half of an all-weather service dock built by Convair. The complete dock consisted of four sections, each 36 feet in depth and 60 feet in length. Two different types of docks were built – one set up permanently on the ramp in front of the Fort Worth and San Diego plants, and the other mobile that could be moved as necessary. (Convair via the San Diego Aerospace Museum)

stantly being reconfigured or awaiting modification, and in reality, an operational capability was not achieved until 1952.

In his book, Meyers Jacobsen mentions one of the more interesting problems encountered by the B-36 units at Carswell. When a part was needed that was manufactured by Convair, which was located a mile across the runway, the 7th BG(H) had to request the part from the Air Materiel Command depot at San Antonio, which in turn requested it from Convair. Convair then shipped the part to San Antonio, which turned around and shipped it to Carswell. Finally, somebody in the Air Force realized the irony of the situation, and allowed Convair to drive the parts across the ramp and deliver them to the B-36 units.

When the B-36B started entering the SAC inventory in the fall of 1948, the Air Force had 59 groups, with an eventual goal of 70 groups. An unexpected decision by President Truman to hold the 1949 defense budget to a ceiling of $11 billion was a serious blow. The problem was no longer how to procure additional aircraft for 70 groups, but how to whittle current forces to 48 groups with the least possible harm to national security. Cancelling the aircraft already on order, with minimum charges to the government, was a difficult task. In the end, over $573 million in contracts were cancelled, costing the government $56 million in penalties.[7]

Surprisingly, the B-36 actually gained from the crisis. The Air Force cancelled the purchase of various bombers, fighters, and transports, but at the same time, endorsed the urgent procurement of additional B-36s. A few months later, the Boeing B-54 (an improved B-50) was cancelled in favor of more RB-36s.



An observers dome, in the roof of the bubble cockpit, allowed the navigator to perform celestial navigation. Note the two wire antennas, one on either side of the fuselage, stretching to the tail. (Peter M. Bowers)

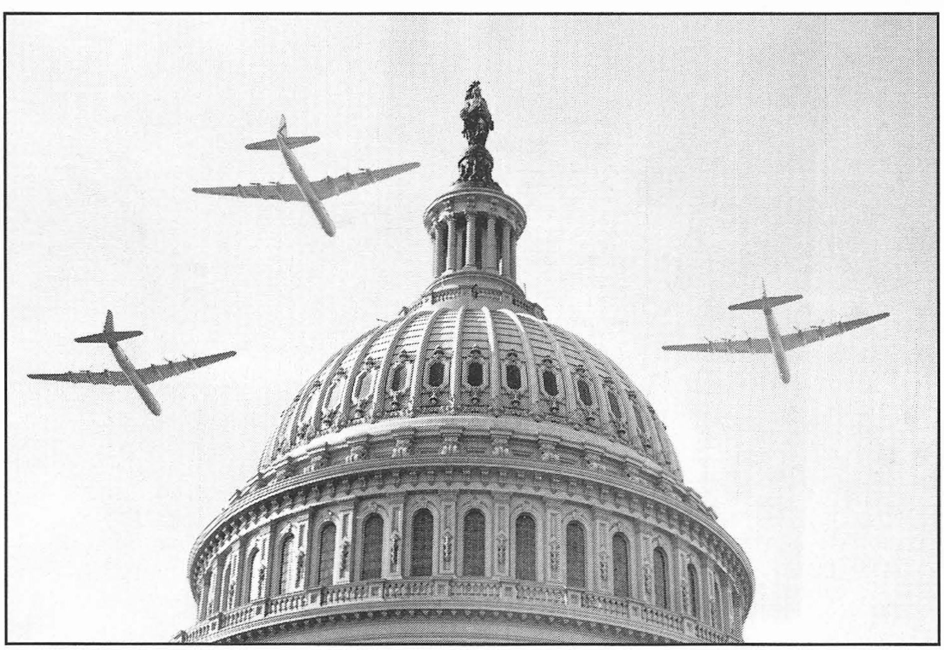
A red-tailed B-36B (44-92039) was on display in Chicago during 1949. Noteworthy is the aerodynamic shape of the early ECM antennas under the forward sighting blister. (Peter M. Bowers Collection)

The three military services immediately began to squabble over which programs were most important. The Air Force and the Navy had long recognized that whichever service possessed the atomic mission would eventually receive a larger share of the budget. Thus, they had grown more and more wary of each other's strategic programs.

The B-36 was the subject of a lot of criticism, especially from the Navy. It was accused of being as slow as the B-24 and far more vulnerable to attack by modern fighters. Since the B-36 had been one of the few survivors in the mass cancellations of early 1949, anonymous reports had begun to circulate charging that undue favoritism and corruption were involved in awarding the B-36 contracts.

At the time, the Secretary of Defense was Louis A. Johnson, a former director at Convair. On 23 April 1949, just a month after entering office, Johnson abruptly cancelled the Navy's first supercarrier, the USS *United States* (CVA-58), which had been ordered by his predecessor to allow the Navy to develop a strategic bombing capability. Funds from the cancellation were used largely to order more B-36s. The Navy was enraged at the cancellation, but the Air Force insisted that strategic bombing was strictly an Air Force responsibility. The decision was justified on the basis that the government could not afford both new strategic bombers and a new carrier force. The B-36 had already demonstrated it was capable of reaching targets inside the Soviet Union, while the entire concept of carrier-borne nuclear bombers had yet to be proven.

On 1 May 1949, however, the Soviets publicly demonstrated



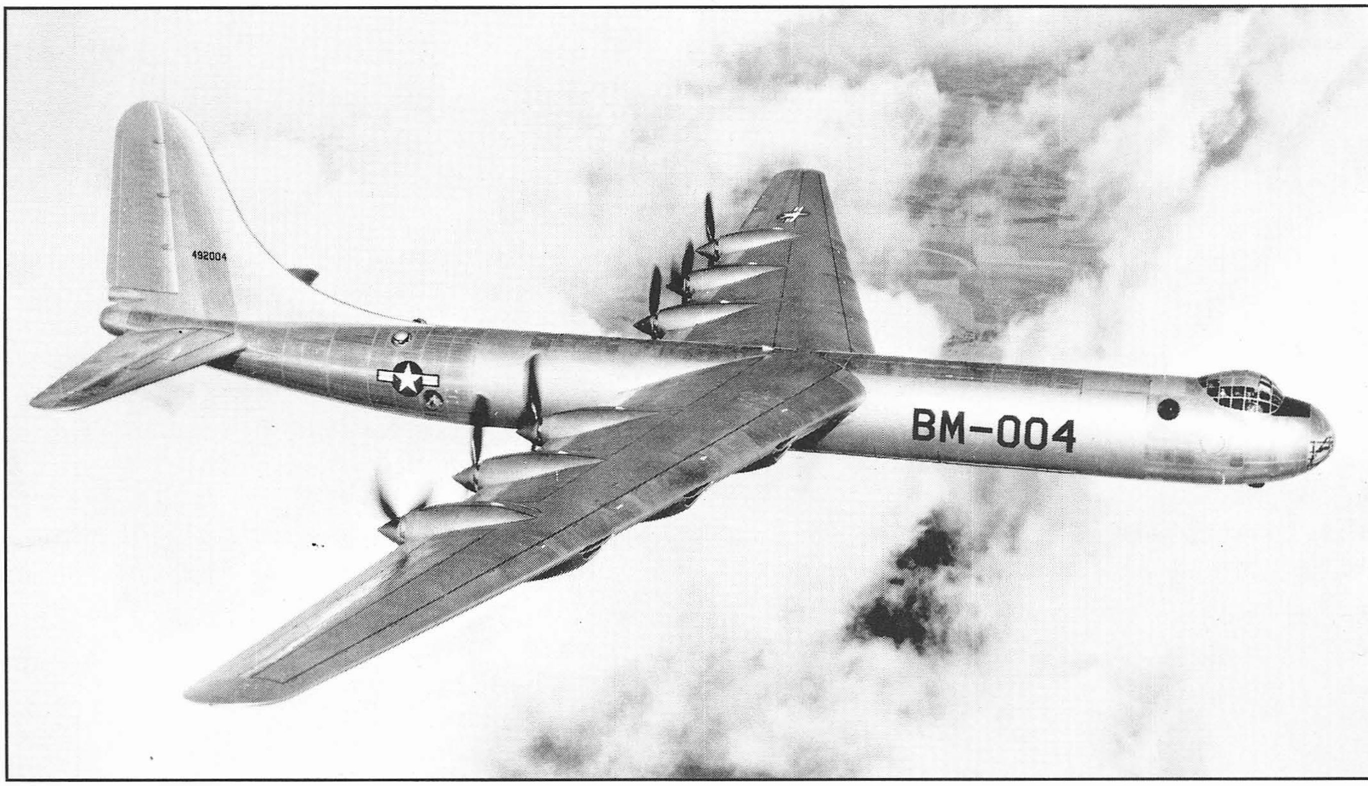
The classic shot of B-36s over the Capitol Building in Washington, D.C. symbolized the raging debate between the Air Force and Navy over who would control the strategic mission in the early 1950s. (Convair via the San Diego Aerospace Museum)

the MiG-15 jet-powered fighter, and there were serious doubts that the B-36 could defend itself against the new fighter. Many officers expressed concerns that the Air Force had spent a fortune on what would turn out to be a sitting duck. An anonymous document began making the rounds in press and congressional circles charging that the aircraft's performance did not live up to Air Force claims.

In June 1949, the House Armed Services Committee opened an investigation of what came to be known in the press as the "B-36 Affair." On 25 August the House committee cleared the Air Force and Convair of any misconduct. Although the B-36 contract survived unscathed, one of the results of these hearings was an amendment to the National Security Act of 1947 which enlarged and strengthened the office of the Secretary of Defense and severely weakened the authority of the individual service secretaries.[8]

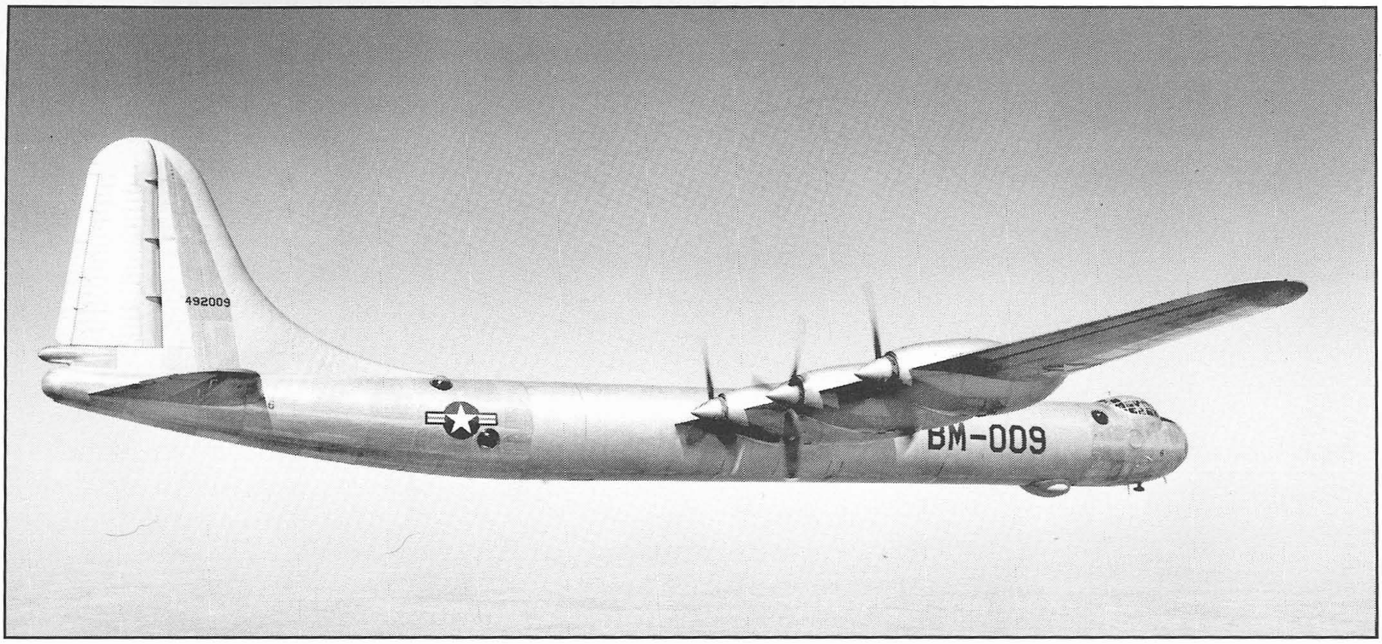
It was not over. In October 1949 congressional hearings resumed, this time on the question of whether the defense of the United States should rely on the Air Force's strategic bombers or the Navy's proposed fleet of aircraft carriers. It resulted in nearly open warfare between the Air Force and the Navy over who would control the nuclear mission. The Air Force argued that it had already demonstrated its ability to perform the mission, while the Navy continued to argue over the technical obsolescence of the B-36. The Navy was still enraged at the cancellation of the *United States*, and Admiral Arthur W. Radford, Commander-in-

Innovative solutions. The tail turret was not readily accessible from the outside of the aircraft, but this ground crew seems to have figured out a suitable work stand. Note that the outer cover has been removed from the turret of this B-36B. (Norm Taylor Collection via Richard Freeman)



The YB-36A (44-92004) only made two flights – one airworthiness flight at Fort Worth, and its delivery flight from Fort Worth to Wright Field in Ohio. Once at Wright Field the airframe was used for structural tests, and was eventually tested to destruction. The aircraft carried only minimal equipment on its two flights, and its place was taken by the YB-36 when the RB-36E conversions were approved. (Convair via the San Diego Aerospace Museum)

Another view of a B-36 being towed from the assembly line. The extreme angle necessary for the vertical stabilizer to clear the building door is evident here. Note the lack of a buzz number on the forward fuselage, and the small U.S. AIR FORCE markings in its place. The "40" on the nose is the manufacturing sequence number, but was normally scratched-out by the censor as restricted information. (Convair via the San Diego Aerospace Museum)



An unarmed B-36A (44-92009) on 15 April 1948. Note the "bullet" antenna under the nose – this was later replaced by a small streamlined fairing that was almost flush with the fuselage. Note the large buzz number on the forward fuselage. (Convair via LMTAS/Mike Moore)

Chief (CinC) of the Pacific Fleet, denounced the B-36 as a "billion dollar blunder," a quote that was picked up by many newspapers across the country. Although there were still doubts about the B-36's ability to survive enemy fighter attack, the program once again survived uncut.

Thankfully, the B-36B was proving to be a capable, if somewhat slow aircraft. The Air Force and Convair were both looking for ways to improve the speed of the B-36, and everybody concerned was working on improving the reliability of the aircraft and its systems. It was now obvious that B-36 production would exceed the original 100 aircraft order, and that the B-36 would be the Air Force's primary nuclear delivery aircraft until development of the jet-powered B-52, and all of its supporting infrastructure (tankers, etc.), was completed, something not expected until 1955 at the earliest.

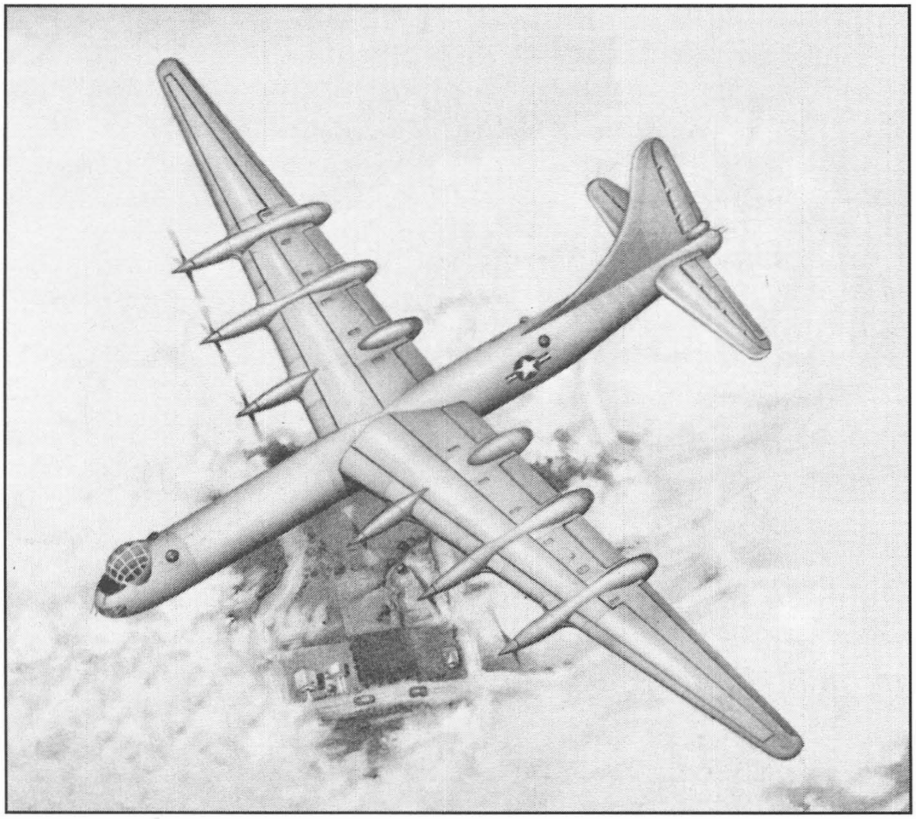
Convair actually built 73 B-36Bs, but the Air Force directed 11 of them to be modified with jet engines prior to delivery – four of the 11 appeared on Air Force rolls as B-36Ds, and seven as RB-36Ds. Therefore, the Air Force formally accepted 62 B-36Bs –31 in FY49,30 in FY50, and the last one in September 1950 (FY51).

By the time the last B-36B was accepted, some had already been returned to Convair to be converted to the B-36D configuration with the addition of four General Electric J47-GE-19 turbojets paired in pods underneath the outer wings. The B-36B phaseout from service was almost as quick as that of the B-36A. Twenty-five B-36Bs were already undergoing conversion during the first half of 1951, and the last of the 60 converted B-36Bs were redelivered during February 1952. Two of the bombers had crashed before they could be converted.

B-36C

Even though the B-36's performance since mid-1948 was exceeding early expectations, the aircraft's relatively slow speed continued to cause concern. Tests had shown that altitude was very important in protecting a bomber, and the B-36 excelled at flying high. Nevertheless, a burst of speed over a target or while under attack increased a bomber's chances of survival.

In March 1947, Convair proposed that 34 aircraft out of the original 100 be completed as B-36Cs powered by 4,300-hp R-4360-51 Variable Discharge Turbine (VDT) Wasp Majors. In other applications, the VDT concept was known as a compound or turbocompound engine, and a variation of the concept was used very successfully on the Wright R-3350s used on the Douglas DC-7 transport. Unfortunately, the use of these engines would require a change from a pusher to a



The B-36C would have presented a major change in the appearance of the B-36. Although the six engines remained in their normal locations behind the aft wing spar, extension shafts would have driven tractor propellers, a change necessitated by the configuration of the VDT engines. Very few images of the project remain. (Convair)

tractor configuration, entailing a significant redesign of some structure, including what amounted to a new wing. Although the engine would remain in its normal position behind the main wing spar, its orientation would be changed to face forward, and it would drive tractor propellers through 10-foot shafts that extended through the wing. In the VDT, exhaust gases from the engine would pass through a General Electric CHM-2 turbosupercharger with a clamshell nozzle that created jet thrust by varying the size of the turbine exit.

Convair claimed that the VDT engine (also proposed for the B-50) would give the B-36 a top speed of 410 mph and a 45,000-foot service ceiling. To offset the cost of adapting the VDT engine to the B-36, Convair suggested deleting three B-36s from the current procurement contract. This was approved in July 1947. Convair hoped additional VDT-equipped B-36Cs would be ordered if the prototype proved successful, but a decision on this matter was deferred.

A new Aircraft and Weapons Board met for the first time on 19 August, and strategic bombing was the first subject to be reviewed. Some board members considered the B-36 obsolete and wanted to concentrate on fast jet bombers, an obvious gamble since early models would have very limited range and would not be available for several years. Others supported installing the new VDT engines on the B-36 and using it as a general-purpose bomber. Still others preferred the B-50 because it was faster than the B-36. After prolonged discussion, a consensus emerged to retain the B-36 as a nuclear bomber that would eventually be replaced by the B-52, and to produce the B-50 as an interim general-purpose bomber to be replaced by the B-47. Given this, there was no particular reason to install the VDT engine in a prototype B-36, and no additional B-36 procurement would be needed. The board's recommendation was approved, and the B-36C prototype was cancelled on 22 August 1947.

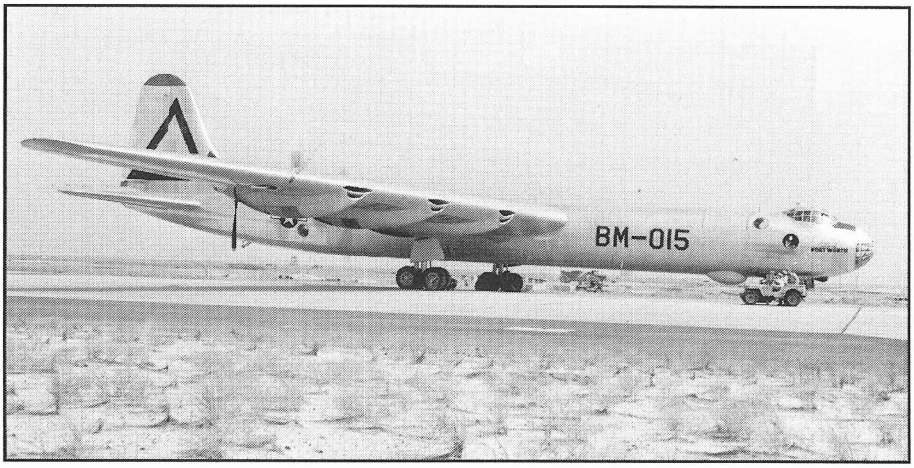
The cancellation of the prototype did not stop Convair from proposing that the last 34 B-36s in the original contract be completed as B-36Cs. Convair estimated that the extra cost of the B-36Cs could be met by reducing the overall procurement to only 95 B-36s, and that the B-36Cs could be produced without delaying the program by more than six months. It was even suggested that the remaining B-36A and B aircraft could be retrofitted to B-36C standards, although no details were forthcoming on how to accomplish this. The Convair proposal for the 34 new-build B-36Cs was accepted on 5 December 1947, however, no decision was made on retrofitting the 61 existing B-36s.

Unfortunately, the B-36C project quickly ran into technical difficulties. There were problems with engine cooling generated by the aircraft's high-operating altitude, which subsequently degraded the engine's power and made Convair's earlier performance estimates unachievable. By the spring of 1948, it had become apparent that the B-36C was not going to materialize,

and the Air Force once again considered canceling the entire B-36 program. By this time, some in SAC had lost faith in the B-36 as a long-range strategic bomber, and believed this relatively slow aircraft would be useful only for such tasks as sea-search or reconnaissance.

Much of this was based on emotion and misinformation. A series of evaluations in mid-1948 showed that the standard B-36B surpassed the B-50 in cruising speed at very long range (mainly because the B-50 had to slow down to refuel), had a higher service and cruise ceiling, a larger payload capacity, and a much greater combat radius than the B-50 (assuming no refueling). It now seemed that the B-36 might be a better aircraft than anyone had expected, and that any hasty reduction in the program might be a mistake.

But it was probably the Soviets who were actually responsible for saving the B-36 program. On 18 June 1948, the Soviets began their blockade of Berlin. On 25 June 1948, Air Force Secretary W. Stuart Symington decided to continue the B-36 program since it was the only truly intercontinental bomber then available. General Kenney endorsed this decision, even though only a month earlier he had been recommending that the B-36 program be halted. The VDT-equipped B-36Cs that had been ordered would revert to standard B-36B configuration. Five aircraft still had to be cut from the original 100 aircraft order to meet inflation and to pay for the development costs of the ill-fated B-36C project.

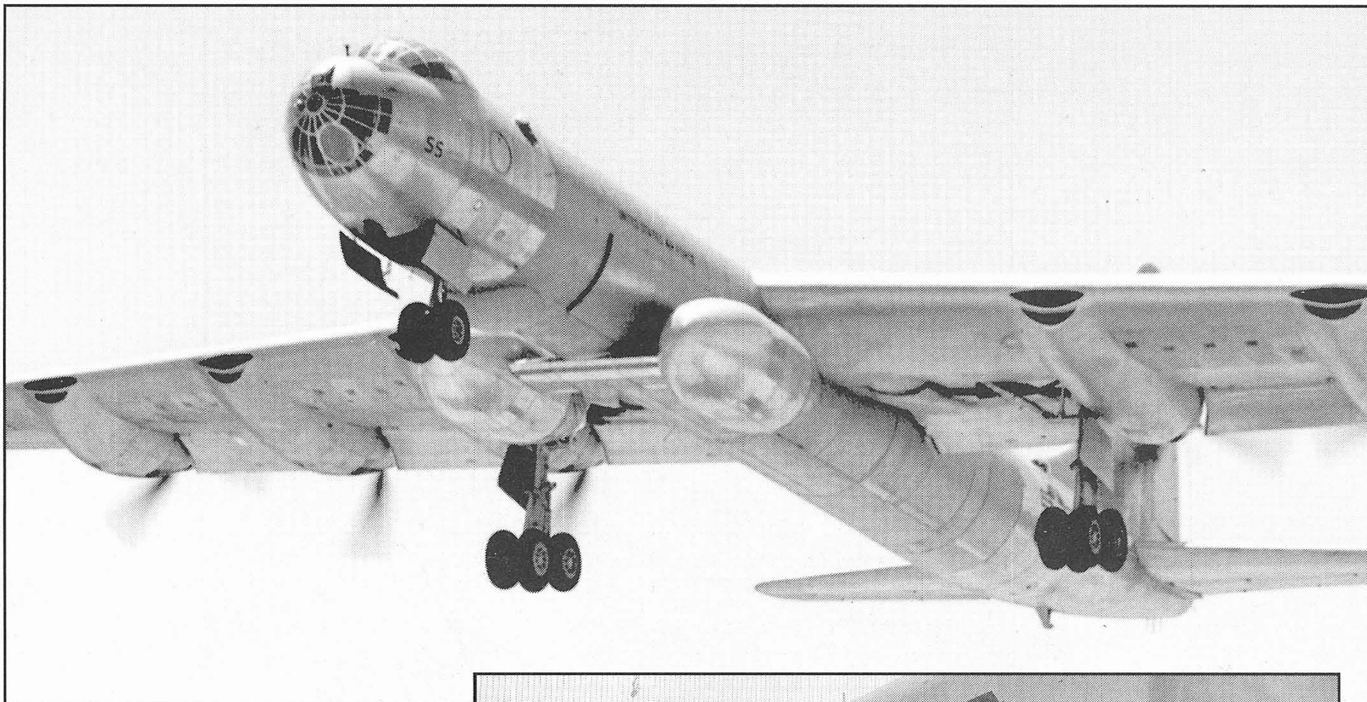


This B-36A was assigned to the 7th BG(H) at Carswell AFB, across the field from the Convair plant. The name on the nose is "City of Fort Worth." (John Wegg via the San Diego Aerospace Museum)

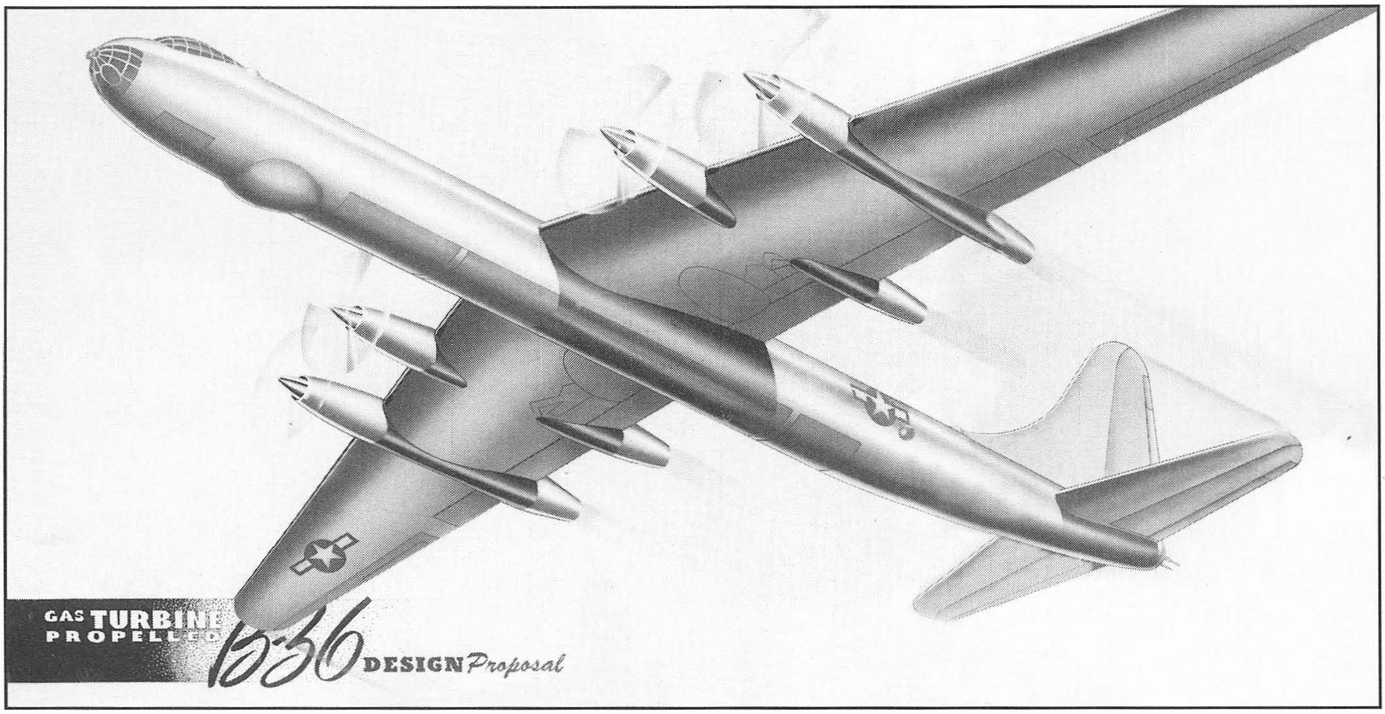
B-36s undergoing modification at San Diego's Lindberg Field, which is located adjacent to San Diego bay. Note the maintenance stands covering the wings on two of the B-36s on the right. (Convair via the San Diego Aerospace Museum)

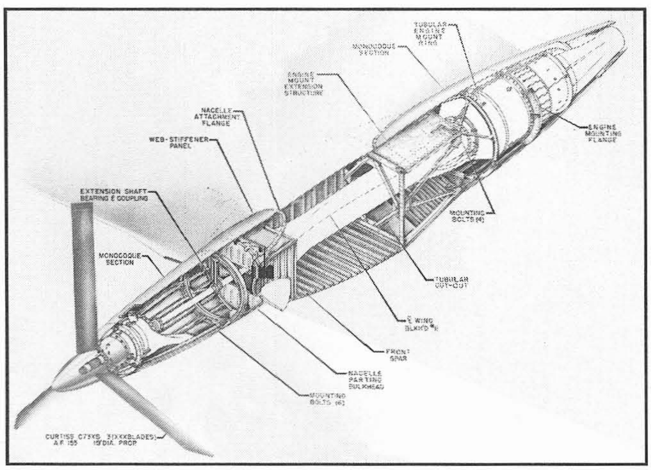
[1] Convair report FZA-36-091, *Summary Report of B-36A Airplane Long Range Simulated tactical Mission Flight Two*, 4 June 1948. [2] Marcelle Size Knack, *Post-World War II Bombers*, Office of Air Force History, 1988, p 21. [3] *Ibid*, p 23. [4] Aviation Week, 18 October 1948, p 12. [5] Marcelle Size Knack, *Post-World War II Bombers*, Office of Air Force History, 1988, p 25. [6] Aviation Week, 15 August 1949, p 14. [7] Aviation Week, 12 September 1949, p 37. [8] Marcelle Size Knack, *Post-World War II Bombers*, Office of Air Force History, 1988, p 27. [9] Aviation Week, 15 August 1949, p 14.

The official B-36B flight and maintenance manuals were not necessarily "politically correct" as these cartoons show. No doubt the cartoons served their purpose of enticing the crew to read them. (U.S. Air Force)

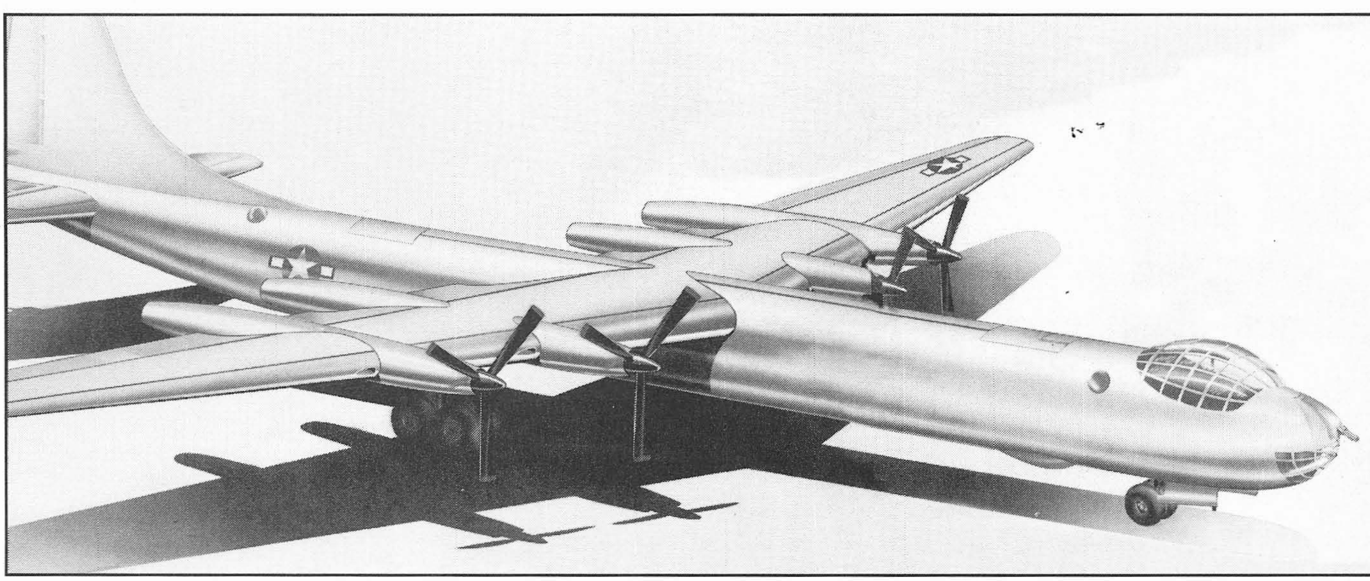


Special carriers were developed that allowed B-36s to transport two complete spare engines, along with their nacelles and accessories. The pods were bolted onto the bomb racks in bomb bay No. 1 – note the open sliding-type bomb bay doors. (Convair via the San Diego Aerospace Museum)





On 14 February 1947 Convair proposed to modify one B-36A (44-92049) with four Curtiss-Wright XT35-W-1 gas turbine engines driving two tractor propellers on each wing. The engines were installed in the same locations normally used by the inboard and center Wasps, and the outer two engine nacelles would be deleted. Each engine was mounted aft of the rear spar with an extension shaft extending forward through the rear and front spars to a reduction gear box and a 19-foot diameter propeller. The installation was expected to cost less than $1.5 million, but was turned down by the Air Force because they believed, correctly, that the Curtiss-Wright schedule was overly optimistic. (Convair via the San Diego Aerospace Museum)



LATE PRODUCTION

B-36D THROUGH B-36J

The government-owned plant at Fort Worth run by Convair (which now produces Lockheed F-16 and F-22 fighters) occupied over 546 acres across the field from Carswell AFB. The buildings occupied 62 acres, with over 4,000,000 square feet of enclosed space and 8,500,000 square feet of paved working areas. An on-site environmental chamber could simulate altitudes as high as 60,000 feet and temperatures of −100°F. The plant employed over 31,000 people while producing one B-36 per week (the average production for most of the run). The plant produced over 68,000 separate parts, in addition to those made by subcontractors. There were 57 major subcontractors (excluding Convair's San Diego plant) and 1,553 suppliers located in 36 states and the District of Columbia. A total of 2,500 machine tools and 126,500 production tools were used, and the assembly line integrated 8,500 separate subassemblies and 27 miles of wiring. The single B-36 line took up more space in the Fort Worth plant than had been occupied by two B-32 production lines during World War II.[1]

The original order for 100 (later reduced to 95) B-36s was based on a unit cost of $4,692,392 per aircraft, of which nearly 50% was government-furnished equipment. Modification of these aircraft to RB-36E and B-36D standard added $1,556,294 per aircraft, for a total of $6,248,686. The second increment of 75 B-36s only cost $4,732,939 per aircraft, including the new bomb/nav system and engines. Part of this reduction was based on the write-off of the production tooling cost after the initial production run. The breakdown of these later aircraft was about 58.2% GFE and 41.8% Convair.[2]

B-36D

On 5 October 1948 Convair proposed installing two pairs of turbojet engines in pods underneath the outer wing panels of the B-36. These engines could be used during takeoff and for short bursts of speed at critical times, and would have only a minimal effect on range.

Unlike the extensive changes needed to install the VDT engines on the still-borne B-36C, only minor modifications would be required to mount the jet nacelles. In fact, Convair was confident that a prototype B-36 with jet engines would be ready to fly less than four months after Air Force approval. The Air Force did not question the obvious merits of the Convair proposal, but approval was delayed by budgetary restrictions looming in December 1948, and the decision a month before to convert the B-36As into RB-36E reconnaissance aircraft.

The new engines were 5,200-pounds-thrust General Electric J47-GE-19 turbojets. The pods were essentially the same as those devel-

Main Differences TABLE

75-102-A

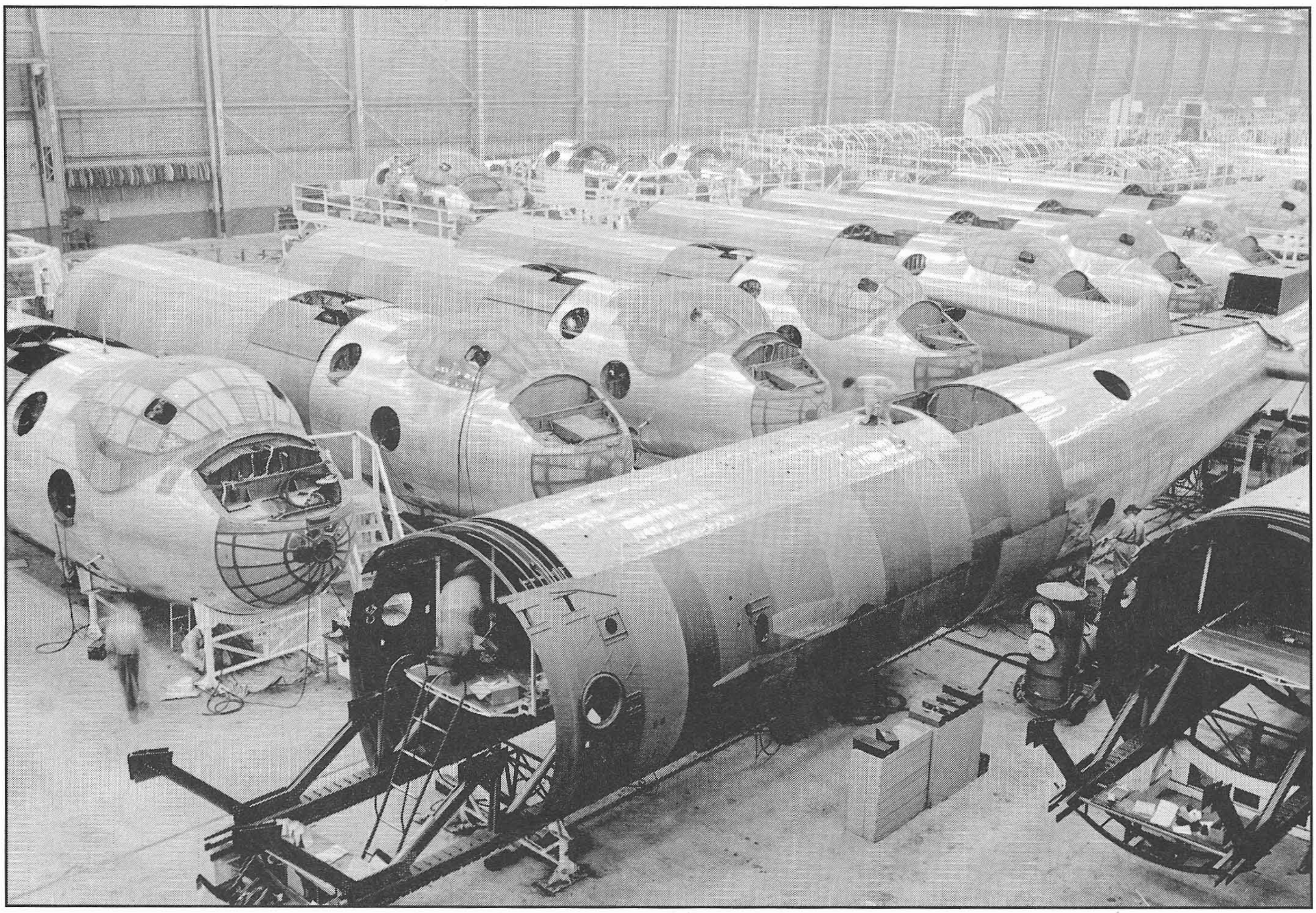
MODEL	DESIGN G.W. (LBS)	PRESSURIZED CREW COMPARTMENTS	CREW	ENGINEER'S STATION	RECIP. ENGINES	WING FUEL TANKS	GUN TURRETS	BOMB BAYS	BOMBING SYSTEM
B-36D	357,500	2	15	SINGLE	R4360-41	8	8	4	K( ) & UNIVERSAL
B-36D-II	357,500	2	15	SINGLE	R4360-41	8	8	4	K( ) & UNIVERSAL
B-36D-III	357,500	2	13	SINGLE	R4360-41	8	1	4	K( ) & UNIVERSAL
B-36F	357,500	2	15	SINGLE	R4360-53	8	8	4	K( ) & UNIVERSAL
B-36F-II	357,500	2	15	SINGLE	R4360-53	8	8	4	K( ) & UNIVERSAL
B-36F-III	357,500	2	13	SINGLE	R4360-53	8	1	4	K( ) & UNIVERSAL
B-36H	357,500	2	15	DUAL	R4360-53	8	8	4	K( ) & UNIVERSAL
B-36H-II	357,500	2	15	DUAL	R4360-53	8	8	4	K( ) & UNIVERSAL
B-36H-III	357,500	2	13	DUAL	R4360-53	8	1	4	K( ) & UNIVERSAL
B-36J	410,000	2	13	DUAL	R4360-53	10	1	4	K( ) & UNIVERSAL
RB-36D & E	357,500	3	22	SINGLE	R4360-41	8	8	2	CONV. & UNIVERSAL
RB-36D & E-II	357,500	3	22	SINGLE	R4360-41	8	8	2	CONV. & UNIVERSAL
RB-36D & E-III	357,500	3	19	SINGLE	R4360-41	8	1	2	CONV. & UNIVERSAL
RB-36F	357,500	3	22	SINGLE	R4360-53	8	8	2	CONV. & UNIVERSAL
RB-36F-II	357,500	3	22	SINGLE	R4360-53	8	8	2	CONV. & UNIVERSAL
RB-36F-III	357,500	3	19	SINGLE	R4360-53	8	1	2	CONV. & UNIVERSAL
RB-36H	357,500	3	22	DUAL	R4360-53	8	8	2	CONV. & UNIVERSAL
RB-36H-II	357,500	3	22	DUAL	R4360-53	8	8	2	CONV. & UNIVERSAL
RB-36H-III	357,500	3	19	DUAL	R4360-53	8	1	2	CONV. & UNIVERSAL

The table from an RB-36H flight manual showing the primary differences between the operational B-36 models. (U.S. Air Force)

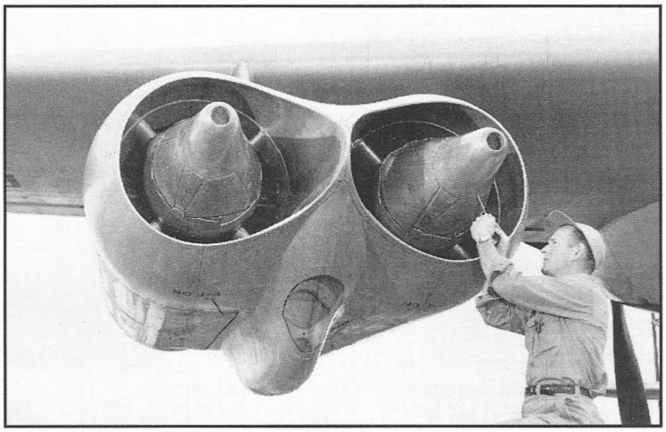
oped for the inboard engines on the Boeing B-47 Stratojet, except that the outrigger landing gear was deleted. The pods were even manufactured by Boeing on the same production line used by the B-47. Special collapsible aerodynamic covers were installed over the engine inlets to minimize drag when the engines were not operating. The engines were modified to burn standard aviation fuel instead of jet fuel so that the B-36 could feed them from the existing fuel supply. This resulted in the engines producing slightly less power than normal, but the trade-off was considered worthwhile. Surprisingly, very little structural modification was required to support the new engine pods, a tribute to how strong the basic B-36 was. Additional oil tanks were installed in the outer wing panels to hold the special oil the jet engines required. Controls and instrumentation for the jet engines were mounted on a separate panel above the pilots' heads.

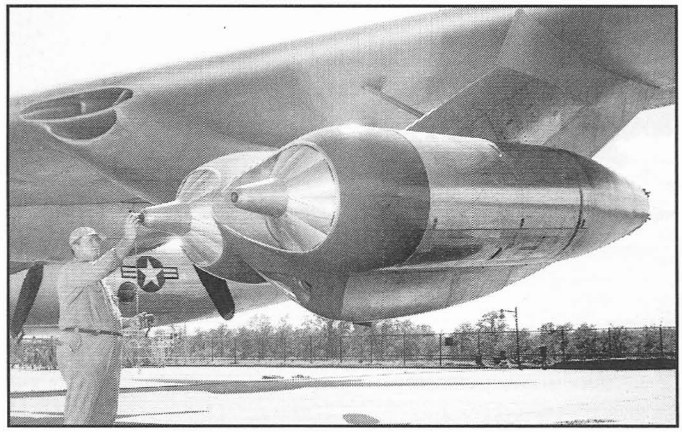
The B-36D was supposed to use an improved K-3A bombing and navigation system. But like many things, development problems prevented the K-3A from being delivered in time to equip the first B-36Ds, which used a K-1 unit that was little more than a refined version of the APQ-24 used in the B-36B. All aircraft were eventually retrofitted with the K-3A. An AN/APG-32 gun-laying radar replaced the APG-3 to direct the tail turret. The B-36D was fitted with "snap-action" bomb-bay doors that could open and close in only two seconds, minimizing the drag penalty usually associated with getting ready to drop bombs over the target. The doors were hydraulically actuated and proved to be more reliable than the earlier sliding doors. Takeoff and landing weights were up to 370,000 and 357,000 pounds, respectively. Another major improvement was that all of the flying surfaces were now covered with metal skin instead of doped fabric.

The nomenclature for the B-36D's



B-36 fuselage sections being built up at Fort Worth prior to being mated on the assembly line. Note the empty space where the nose turret will be installed. (Convair via LMTAS/Mike Moore)



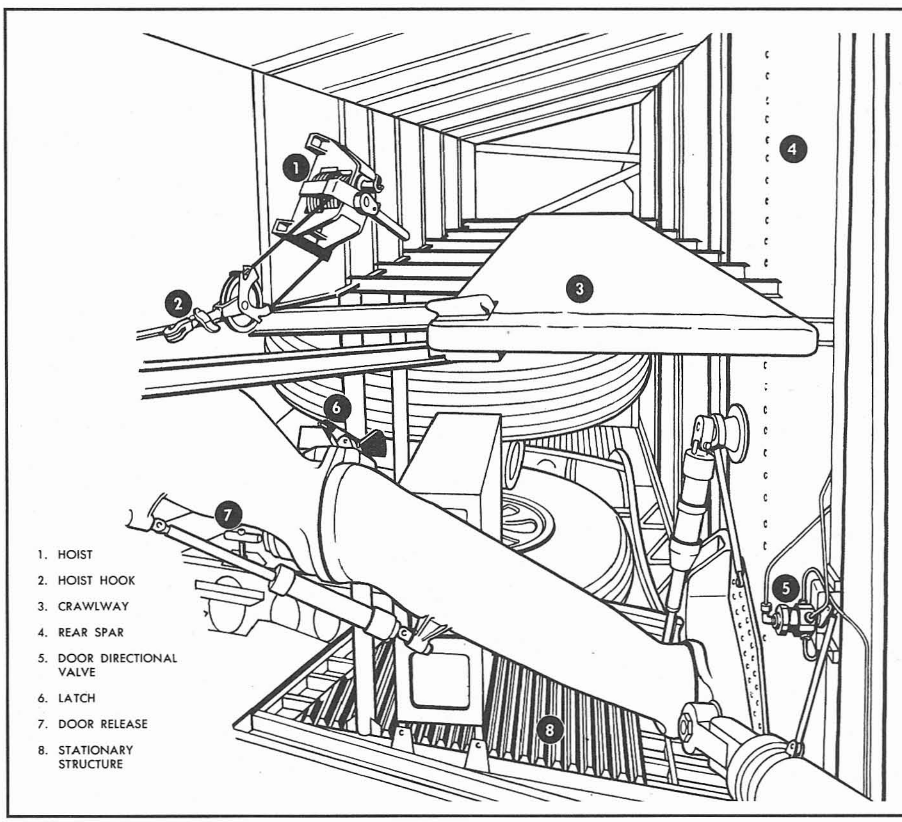


Two pairs of J47 turbojet engines were introduced on the B-36D, and would be a feature of all subsequent production models. The engine pod itself was essentially identical to the one used on the Boeing B-47 although the outrigger landing gear was deleted. Since the engines were not intended to be used all the time, special aerodynamic covers were designed that closed-off the air intakes when the engines were not in use. The intakes are shown open at left and closed at right. (Convair via the San Diego Aerospace Museum)

15 crewmembers changed slightly: aircraft commander, two pilots, two engineers, navigator, bombardier, two radio operators, and an observer forward; and five gunners aft. In reality, one of the radiomen operated the ECM equipment, the other operated the nose turret, while one of the pilots and the observer operated the forward upper gun turrets.

The conversion of a single B-36B (44-92057) to the B-36D configuration was authorized on 4 January 1949, and the aircraft made its first flight on 26 March 1949. Due to the unavailability of production engines, it had four Allison J35 engines in the pods in place of the later J47s. The only external difference was that this installation did not include a sway-brace that was used on production examples to correct a slight vibration problem.

The last 11 B-36Bs were equipped with jet engines on the assembly line, becoming B/RB-36Ds prior to delivery. The first new-build B-36D flew on 11 July 1949. The first B-36D was accepted by the Air Force in August 1950 and sent to Eglin AFB for testing. By June 1951, 26 B-36Ds had been



At the fuselage junction, the B-36 wing was over 7.5 feet thick. A crawlway inside the wing allowed crewmembers to perform minor maintenance on the landing gear and R-4360 engines while the aircraft was in flight. This crawlway was not pressurized, and that the conditions inside the wing were extremely cold at high altitude. The crew wore exposure suits and carried oxygen, but working in this environment for even short periods of time was not pleasant. (U.S. Air Force)

delivered, and the last of 76 B-36Ds was accepted in August 1951.[3]

A decision was made to add the engines to all existing B-36As and B-36Bs (becoming RB-36Es and B-36Ds). The Fort Worth plant was already overcrowded building the B-36, so after the first five B-36Bs were converted, the modification effort was transferred to San Diego. Each aircraft was completely overhauled, and new control surfaces, jet engines, and the "snap-action" bomb bay doors were added. The first B-36B (44-92043) to be converted arrived at San Diego on 6 April 1950, and was redelivered to the Air Force in November. The last (44-92081) was delivered to the Air Force on 14 February 1952. All B-36B conversions resulted in B-36Ds – there were no converted RB-36Ds.

The performance benefit was significant. Although originally the Air Force claimed the new engines boosted the top speed to 439 mph at 32,120 feet and the service ceiling to 45,020 feet, this was later revised to 406 mph at 36,200 feet and a service ceiling of 43,800 feet. Whether this slight discrepancy was due to miscalculation, some overzealous public relations (the Congressional hearings were underway at the time), or changes in the aircraft themselves is not certain. The takeoff run was reduced by almost 2,000 feet.

Although still a great deal lower than the performance expected from the B-52, the B-36 was no longer considered a "sitting duck" and could outrun most contemporary fighters at high altitude. (The speed quoted for an aircraft is usually at its best operating altitude – for contemporary fighters this was about 20,000 feet. The fighters generally lost several hundred mph by the time they got to 40,000 feet, if they could get there at all.)

At the end of 1951 the B-36's defensive armament system still remained operationally unsuitable. In fact, SAC viewed the "gunnery and defensive armament as the weakest link in the present B-36 capability." In April 1952 SAC ordered a series of gunnery missions known as FIRE AWAY to be completed by July. These showed that the performance of the B-36's defensive armament system was due in part to poor maintenance, and to inadequate gunnery crew training. This prompted TEST FIRE, a three month exercise that began in September 1952.

As anticipated, TEST FIRE confirmed the overall conclusion of FIRE AWAY that the performance of the B-36's defensive armament was nearly as bad as ever. Because of this, HIT MORE was launched in early 1953 to pool the efforts of the Air Force, General Electric, and Convair to finally devise an effective defensive system. The HIT MORE results were encouraging, and proved that the B-36's defensive armament could be made to work well after numerous but minor modifications. More effective training of the gunners and maintenance personnel was the final link in obtaining a truly operational system.

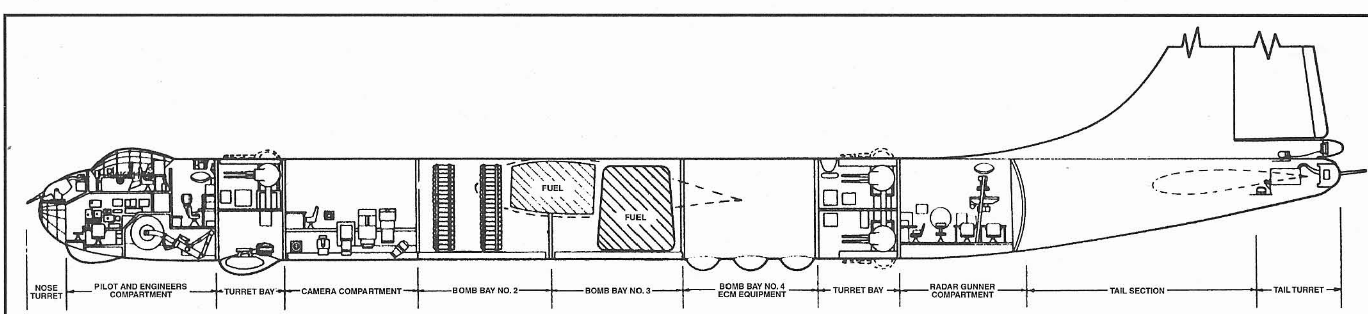
The modification line at San Diego was kept busy for a good part of the B-36's operational career. Initially the facility was responsible for converting B-36As and B-36Bs to the RB-36E and B-36D configuration. Later various operational upgrades were carried out at San Diego. (Convair via the San Diego Aerospace Museum)

The weather at the northern bases could be horrible. Here a B-36D takes-off from Eielson AFB near Fairbanks during the joint Army-Air Force Alaskan Theater winter maneuvers on 15 February 1954. Code named Operation NORTH STAR, temperatures as low as –40°F hampered maintenance but did not prevent the success of the air operation. (San Diego Aerospace Museum Collection)

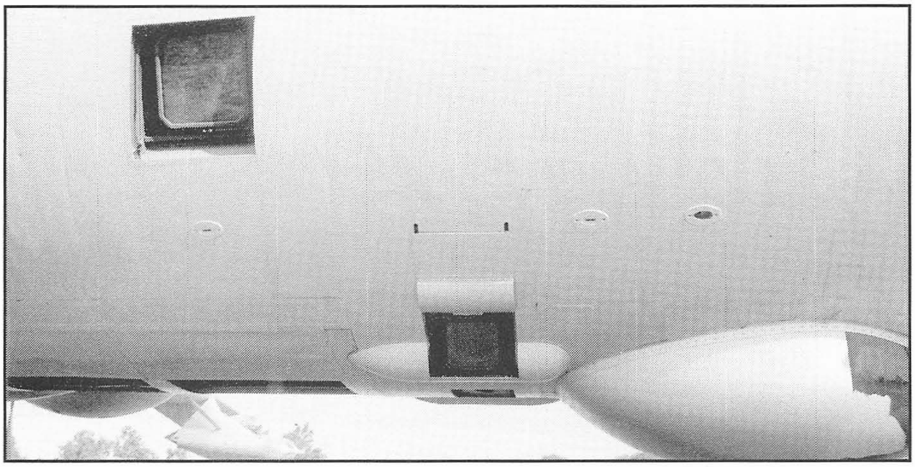
RB-36D

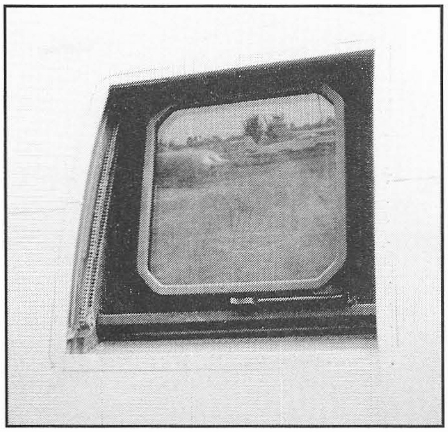
General LeMay strongly influenced the decision to produce a reconnaissance version of the B-36. LeMay had observed first-hand the lack of reconnaissance capability against Japan during World War II. One of his first actions upon taking command of SAC was to insist on an up-to-date supply of strategic reconnaissance aircraft. LeMay ordered the largely non-combat-capable B-36As converted to strategic reconnaissance aircraft under the RB-36E designation while Convair began to manufacture new-build RB-36Ds.

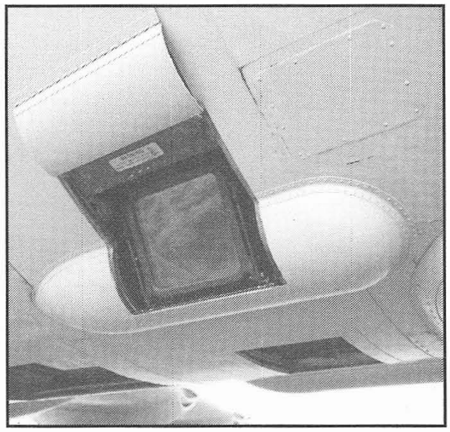
The RB-36D was a specialized photographic-reconnaissance was generally similar to the bomber version, but carried a crew of 22 to operate and maintain the photographic reconnaissance equipment. The forward (No. 1) bomb bay was modified into a pressurized compartment that contained 14 K-17C, K-22A, K-38, and K-40 cameras, including one with a 48-inch focal length lens. Bomb bay No. 2 carried 80 T86 flash bombs, and bomb bay No. 3 contained an auxiliary fuel tank. The last bomb bay was available for weapons, but often contained a special pallet that contained ECM and electronic ferret equipment. When the pallet was carried, three large radomes were mounted on the bottom of the fuselage. Later, the ECM and ferret equipment would be moved



The RB-36D was representative of all the RB-36 models, with a camera compartment located in bomb bay No. 1, flash bombs in No. 2, fuel in No.3, and an ECM/ferret pallet in bomb bay No. 4. Later the electronic equipment would be moved to the aft fuselage to allow bomb bay No. 4 to carry nuclear weapons. (U.S. Air Force)



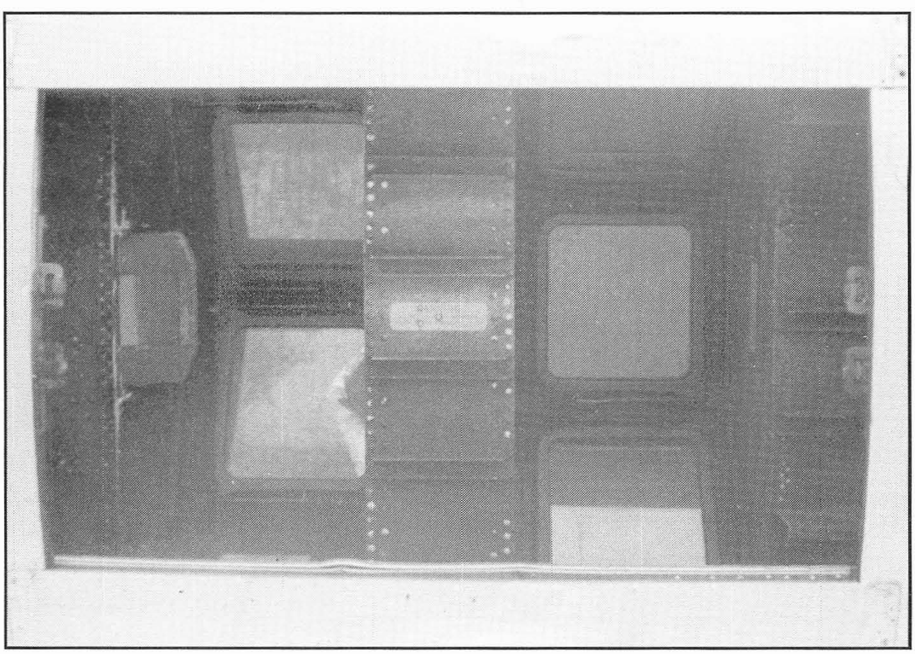


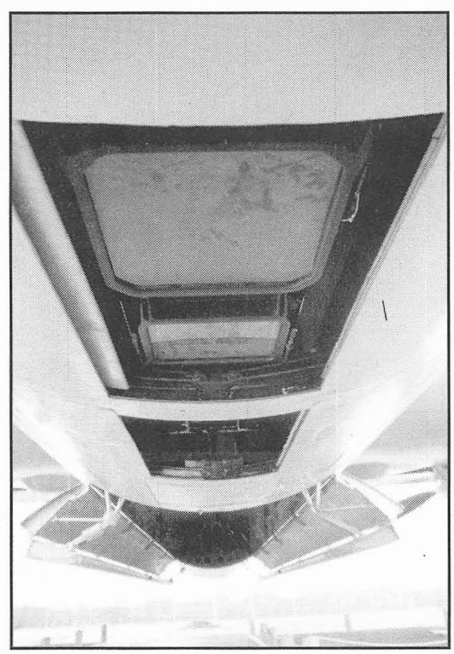


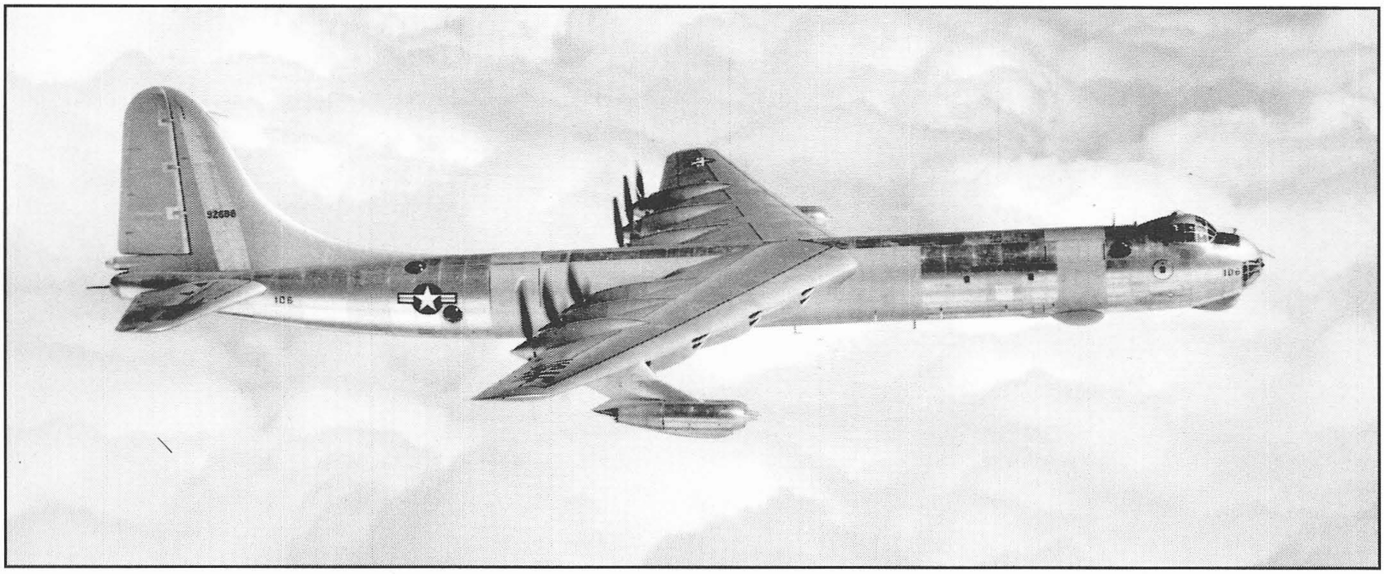
The RB-36-series of aircraft had a wide variety of cameras. Each side of the fuselage (top and above) had two camera ports. Underneath the fuselage also had two large camera ports, each with multiple cameras (below). All the camera ports were covered by doors when not being used. These photos are of the RB-36H preserved at Castle AFB, California. (Dennis R. Jenkins)

within the aft fuselage and the three radomes would be moved about 20 feet aft, freeing up the fourth bomb bay to carry nuclear weapons. The normal defensive armament of sixteen 20-mm cannon was retained.

The first RB-36D (44-92088) made its maiden flight on 18 December 1949, only six months after the jet demonstrator had flown. For some reason, this initial flight was made without the turbojet pods, although these were added before the aircraft was turned over to the Air Force. The RB-36D actually preceded the B-36D into service with SAC by a couple of months, and the first seven RB-36Ds came off the production line before any bomber-versions of the jet-augmented design. All of the 24 RB-36Ds were "new-build" aircraft although the first seven had originally been ordered as B-36Bs and were modified on the production line before being delivered as RB-36Ds. All were delivered to the 28th Strategic Reconnaissance Group at Rapid City AFB, North Dakota (now Ellsworth AFB)







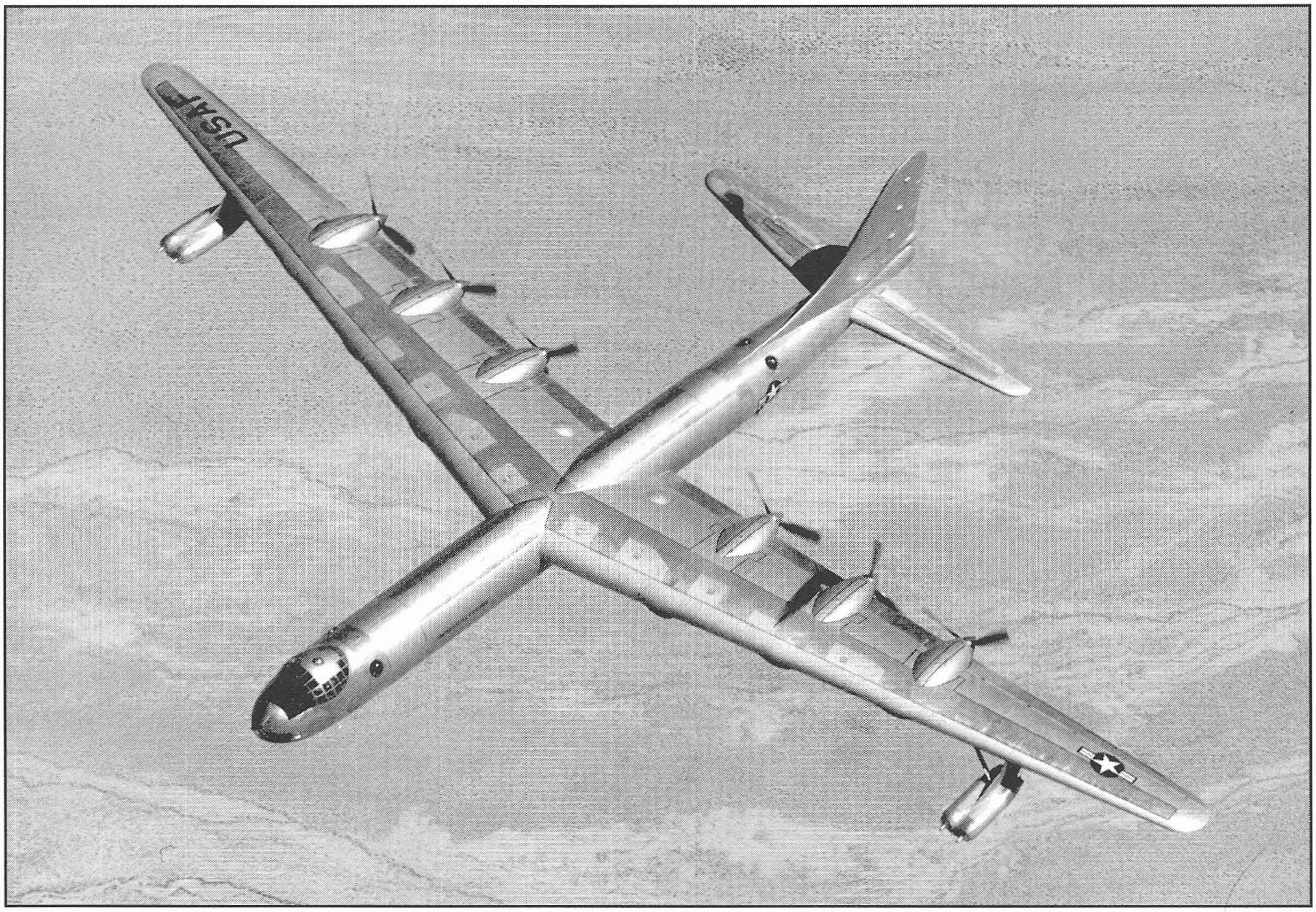
The different areas using aluminum skin (shiny) and magnesium skin (dull) are readily apparent on this RB-36D (49-2688) during its acceptance flight. The RB-36s used aluminum to cover the new pressurized camera compartment where the bomber versions used magnesium to cover bomb bay No. 1. (Convair via the San Diego Aerospace Museum).

between June 1950 and May 1951.

The longest known B-36 flight was made by a Convair test crew flying an RB-36D (44-92090). The aircraft took off at 09:05 on 14 January 1951, and landed at 12:35 on 16 January – exactly 51.5 hours in the air. Although this flight was unusual, most B-36 flights lasted more than 10 hours, and it was not unusual for missions to last 30 hours. The average training mission was scheduled for 24 hours.

One RB-36D (44-92088) was modified to carry a "Boston Camera" with a 240-inch focal length lens. Even the B-36 could not actually carry a camera over 20 feet long, so the lens used a set of mirrors to achieve the 240-inch effective length. Each negative measured 18x36 inches and the camera was reportedly

The first RB-36D had been ordered as a B-36B, but was converted during production to the new configuration. For some reason the aircraft made its first flight without the jet engines, although these were installed before the aircraft was delivered to the Air Force. Note the ECM radomes under the nose and under bomb bay No.4, and the various ECM antennas on the lower fuselage sides just above the APS-23 search radar radome. (Convair via the San Diego Aerospace Museum).



Other than the addition of the jet engine pods, there was little external difference between the late production B-36s and the earlier B-36A and B-36B. There was also virtually no external difference between the various late production variants – essentially you had to look at the serial number to differentiate the models. The "bumps" on the upper wing surface near the fuselage were added to accommodate the four-wheel main landing gear. (San Diego Aerospace Museum Collection).

able to photograph a golf ball from 45,000 feet. The camera was tested for about a year prior to being removed from the RB-36D in 1955 and installed in a C-97. The camera was never used operationally, and was donated to the Air Force Museum in 1964.

RB-36E

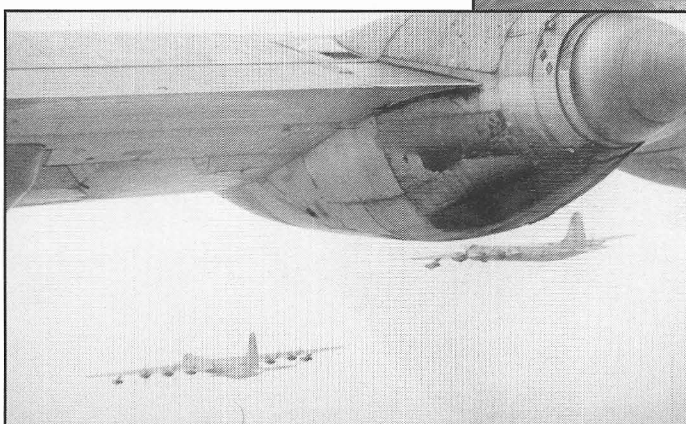
In an effort to quickly gain an intercontinental reconnaissance capability, Gen. LeMay ordered the B-36A fleet converted into RB-36Es that were substantially similar to the upcoming RB-36D. Since the YB-36A (the first B-36A) was going to be destroyed during structural testing, the original YB-36 (42-13571) was also modified to RB-36E standard to give the Air Force 22 aircraft. The R-4360-25 engines were replaced by R-4360-41s, and the aircraft were also equipped with the four J47 jet engines. The same reconnaissance cameras and electronic systems scheduled for the RB-36D were used. The aircraft were also fitted with the 20-mm defensive armament that had not been ready when they were initially built, and they also received the new "snap action" bomb bay doors used on the B-36Ds. The last conversion was completed in July 1951. Like the RB-36D, the RB-36E was designed for all-purpose strategic reconnaissance, day-and-night mapping and charting, as well as bomb damage assessment missions.

B-36F

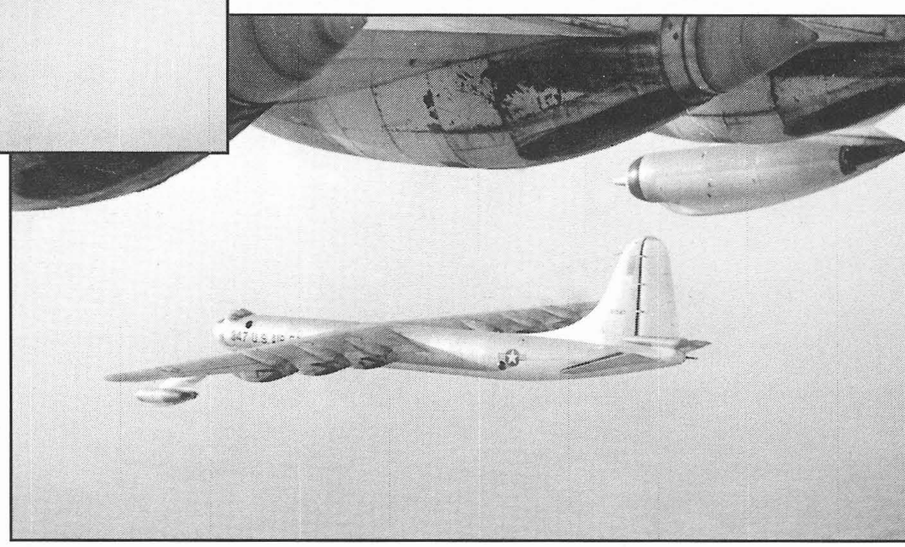
The B-36F differed from the B-36D primarily in having more powerful 3,800-hp R-4360-53 engines, boosting the top speed to 417 mph, and the service ceiling rose to 44,000 feet. Late production aircraft (beginning with 50-1064) also had

an A-7 dispenser capable of dropping 1,400 pounds of chaff to confuse enemy radars. There were very few other changes, mainly just minor rearrangement of some cabin equipment.

The first B-36F made its maiden flight on 18 November 1950, and was accepted by the Air Force in March 1951. The first B-36F did not reach SAC until August 1951, the aircraft having been used for continued testing up until that time.[4]



This was the view from a rear gunner's position on the B-36. The pilot also relied on the gunners to observe the engines for smoke and oil leaks. (Max Campbell)



At first, the R-4360-53 engines of the B-36F were not entirely satisfactory because of excessive torque pressure as well as ground air cooling and combustion problems. However, these problems were resolved fairly quickly, and the new engines proved to be quite reliable in service.

RB-36F

The Air Force ordered 24 RB-36F long-range reconnaissance versions of the B-36F. The first four RB-36Fs were accepted in May 1951, with the last being delivered in December 1951. The reconnaissance equipment in the aircraft was generally similar to the RB-36D.

On 16 June 1954, SAC's four RB-36-equipped heavy strategic reconnaissance wings were given a primary mission of strategic bombing with reconnaissance becoming a secondary mission. On 1 October 1955, the RB-36 reconnaissance wings were redesignated heavy bombardment wings, while retaining a latent reconnaissance capability. To better accommodate the change in missions, most RB-36s had their ECM/ferret equipment moved from the pallet in bomb bay No. 4 to locations in the aft fuselage, freeing up the bomb bay to carry bombs, including nuclear weapons.

B-36G

The B-36G was the designation initially applied to a swept-wing, jet-powered version of the B-36F. Two B-36Fs (49-2676 and 49-2684) were ordered converted to B-36Gs, but the designation was changed to

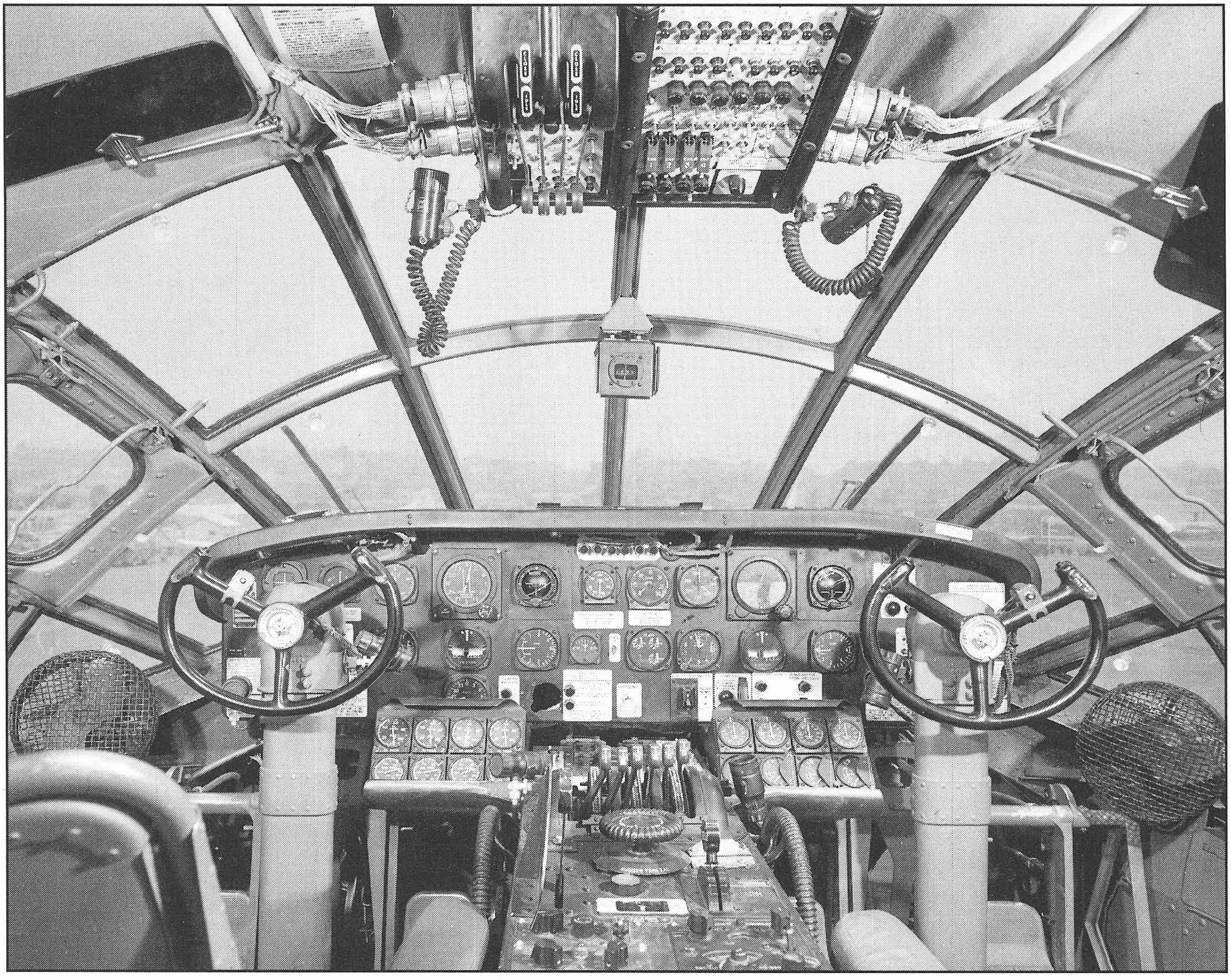
YB-60 before they were completed. See Chapter 6 for more details.

B-36H

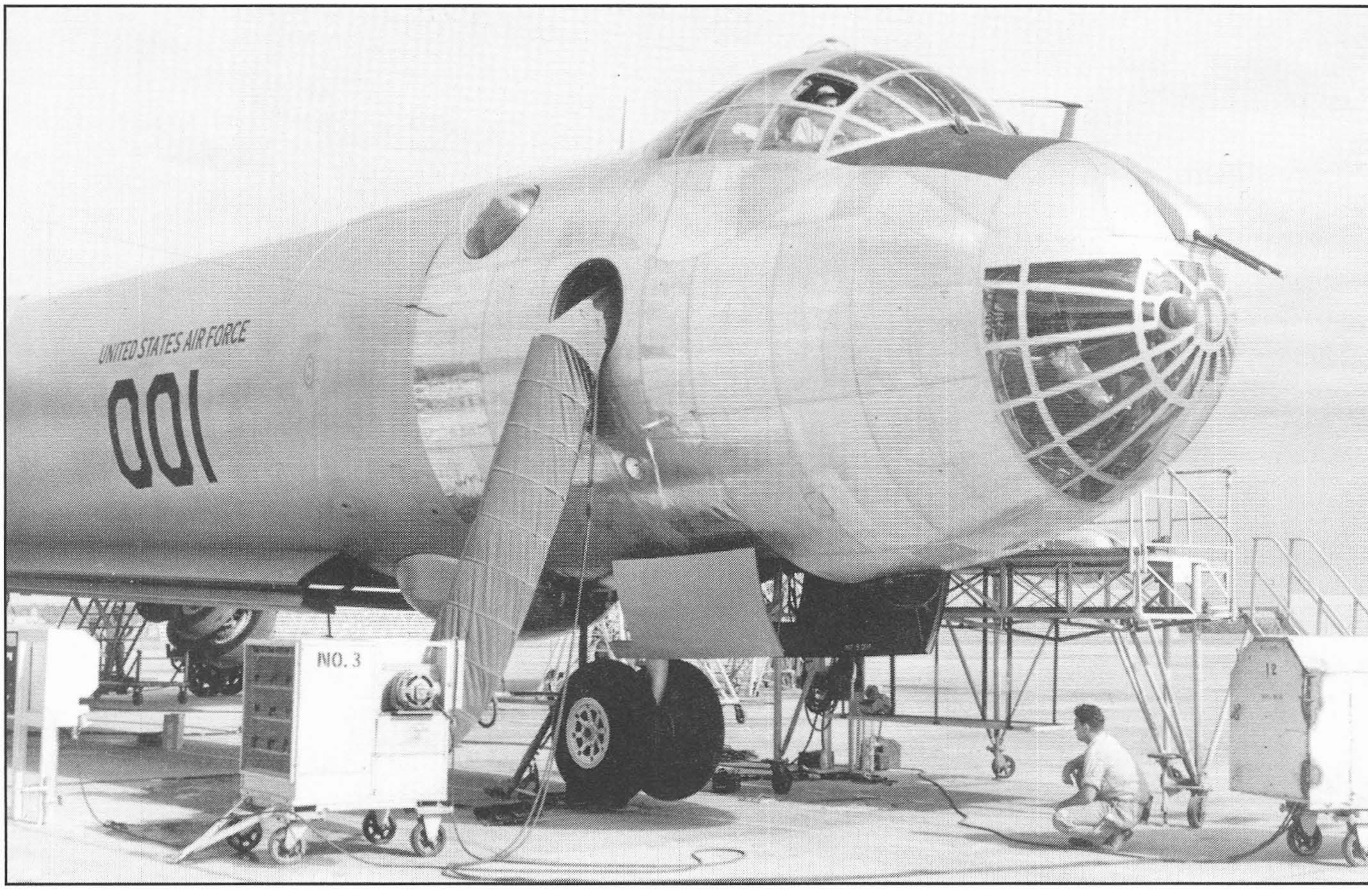
The B-36H was the major production version of the B-36, with a total of 83 being built. The B-36H was much the same as the B-36F, but relocated the K-system electronic components to pressurized compartment to facilitate in-flight maintenance, and featured a rearranged flight deck with a second flight engineer. A new AN/APG-41A gun-laying radar used twin tail radomes, and was essentially two APG-32s, allowing one radar to track an immediate threat while the second continued to scan for other threats. The engines were six R-4630-53s and four J47-GE-19s, the same as the B-36F. Slightly improved ECM equipment was included, as was the capability to carry 1,400 pounds of chaff to confuse enemy radars (something introduced on late B-36Fs).

The B-36H was flown for the first time on 5 April 1952, although deliveries did not begin until December 1952. One of the reasons deliveries were held up was that an RB-36F had suffered a pressure bulkhead failure while flying at 33,000 feet. The accident was traced to a defective bulkhead, and all B-36s were restricted to altitudes below 25,000 feet until the entire fleet could be inspected and defective bulkheads replaced. The Air Force deferred delivery of new aircraft until they were modified.

Due to an intermittent vibration, the B-36's original propeller blades carried flight restrictions that ham-



The pilot's stations on the B-36D. Note the jet controls on the overhead panel – a convenient place to locate them that did not require rearranging the main instrument panels. (Convair via LMTAS/Mike Moore)



A ground cart is providing cooling air for this B-36D (49-2652) through one of the crew access hatches. The two 20-mm cannon in the nose turret were controlled by the periscopic sight offset just off the centerline in the glazed nose. Note the modified buzz number, now just a sequential number applied by the Bomb Wing. (Peter M. Bowers)

pered performance. A new blade, made by a special flash-welding process, could be used freely except for landing and takeoff. This blade weighed an extra 20 pounds (1,170 pounds each), but its greater efficiency promised to compensate for the loss in aircraft range. The first of 1,175 were installed on the B-36H, although they were later retrofitted to most of the fleet.

RB-36H

The Air Force bought 73 long-range reconnaissance versions of the B-36H. The camera and ECM/ferret equipment was generally similar to the earlier RB-36s, while all other systems were identical to the standard B-36H.

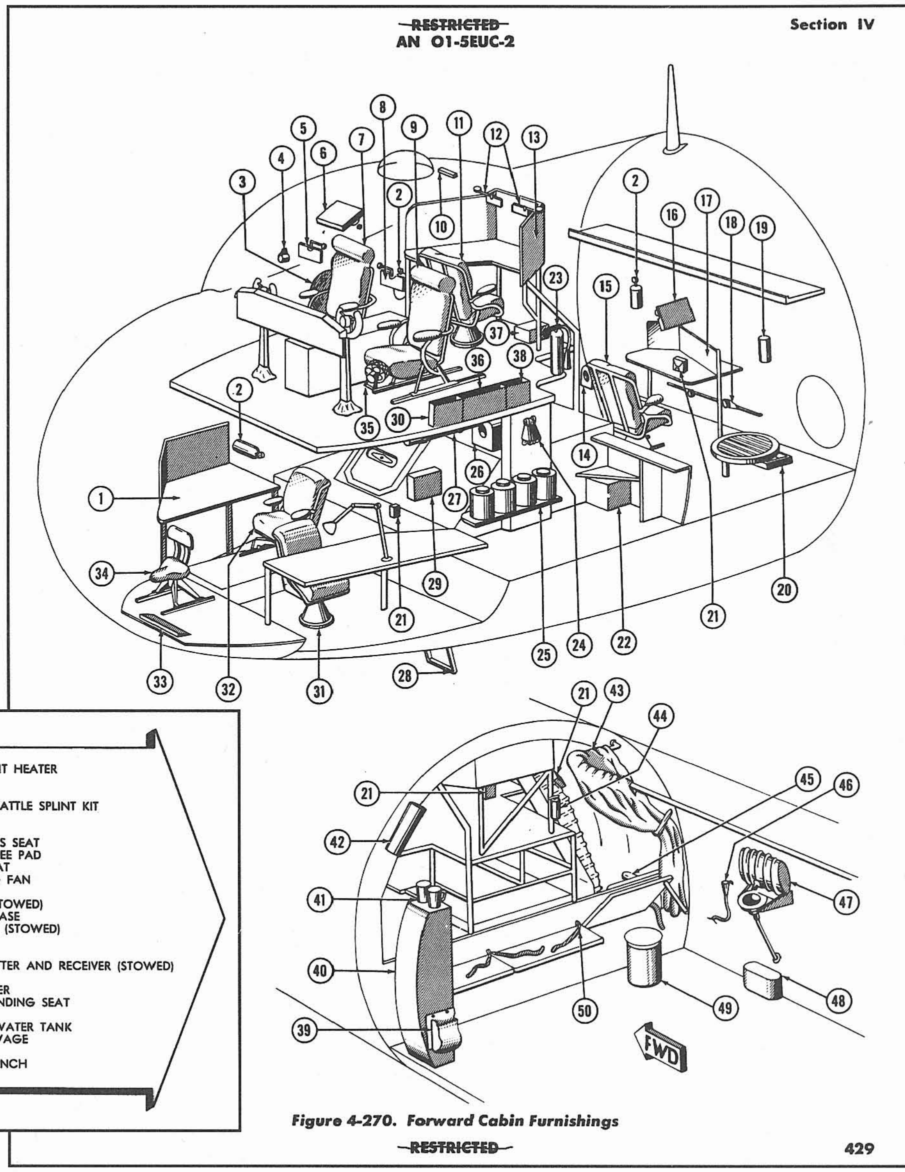
B-36J

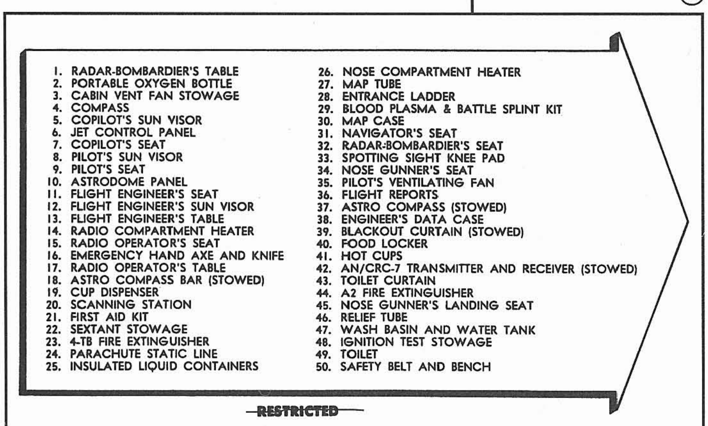
The B-36J was the final production version of the B-36. It had two additional fuel tanks, one in each outer wing panel, which increased the fuel load by 2,770 gallons. The aircraft also had a stronger landing gear which permitted a gross takeoff weight of 410,000 pounds. The only external change was a single elongated radome to cover the twin antennas of the APG-41A gun-laying radar in the tail, a change that had been introduced during B/RB-36H production.

The first B-36J made its maiden flight in July 1953. The last 14 of the 33 B-36Js were completed as Featherweight III aircraft, with the last being delivered to the Air Force on 14 August 1954. These were the only Featherweight aircraft to be completed as such on the production line (others were modified after production). The reduction in weight enabled a service ceiling of 47,000 feet to be reached, although some missions were flown over 50,000 feet. Featherweights cost approximately \$100,000 less, mainly because they did not carry the 20-mm cannon or turrets.[5] Later B-36Js were delivered with new "anti-flash" white paint protecting sensitive areas of the lower wing and fuselage. The same paint scheme, meant to protect from the heat flash from a near-by atomic weapon detonation, was subsequently applied to selected other B-36s.

SAC had no critical problems with the B-36Js. For that matter, the entire B-36 fleet showed improvement, largely because of Project SAM-SAC. This program, initiated in 1953, required the cyclic reconditioning of all operational B-36s (215 as of September 1954) and constantly tied up 25 aircraft in depots. The intensive maintenance paid off for both the older B-36s and the latest and final B-36Js. In the same vein, the crew-to-aircraft ratio (too low for many years) began to improve as the number of combat-ready crews grew steadily.

The B-36 was certainly outmoded by mid-1955, but it had served well





The forward crew cabin of the B-36D – all B-36s were generally similar with the exception of the the B-36H and B-36J which added a second flight engineer seat on the flight deck. (U.S. Air Force)

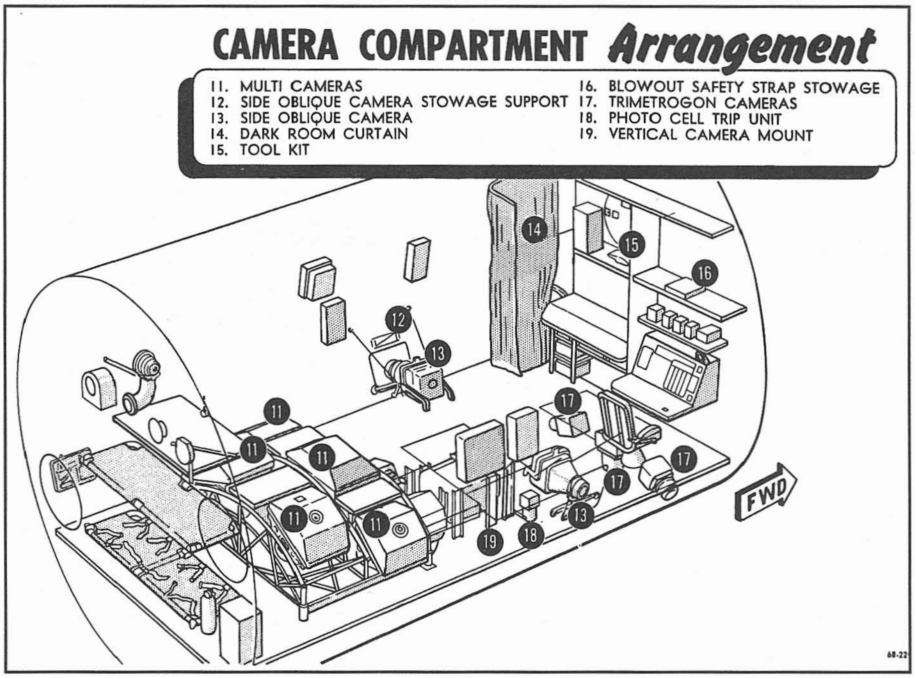
as SAC's primary atomic bomb carrier and perhaps the major deterrent to Soviet aggression. Meanwhile, the Air Force found ways to keep enhancing its effectiveness. The Quick Engine Change Program combined an engine and accessories in a power package that could be quickly installed in the field. Applied to other aircraft as well, the change program for B-36s ran from 1953 until September 1957.

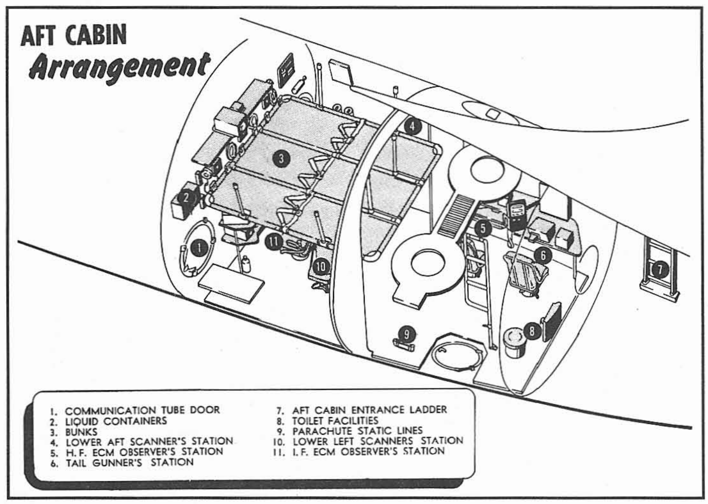
The B-36 was scheduled to be replaced by B-52s, and beginning in February 1956, B-36s were flown to Davis-Monthan AFB where the Mar-Pak Corporation handled their reclamation. However, defense cutbacks in FY58 slowed the B-52 procurement process, and caused the B-36 service life to be extended. Mar-Pak's contracts were put on hold, and components were salvaged from retired aircraft to keep the operational B-36s flying (since spare parts were no longer being produced). Further update work was undertaken by Convair at San Diego throughout 1957 to extend the life of the B-36s.

By December 1958, only 22 B-36Js remained in the operational inventory. On 12 February 1959, the last B-36J (52-2827) left Biggs AFB, Texas, where it had been on duty with the

[1] Aviation Week, 28 January 1952, p 47. [2] Aviation Week, 12 September 1949, p 37. [3] Marcelle Size Knack, *Post-World War II Bombers*, Office of Air Force History, 1988, p 34. [4] *Ibid*, p 41. [5] *Ibid*, p 51.

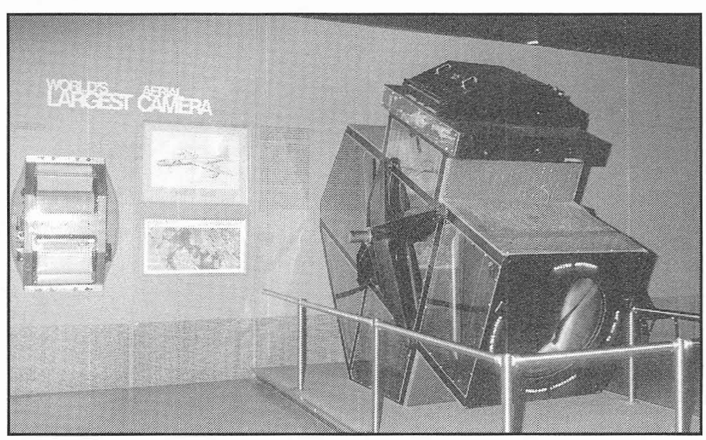
95th BW(H), and was flown to Amon Carter Field in Fort Worth, where it was put on permanent display. The retirement of this B-36 marked the beginning of a new era – SAC became an all-jet bomber force on that day. Within two years, all but four B-36s which had been saved for museum display had been scrapped.



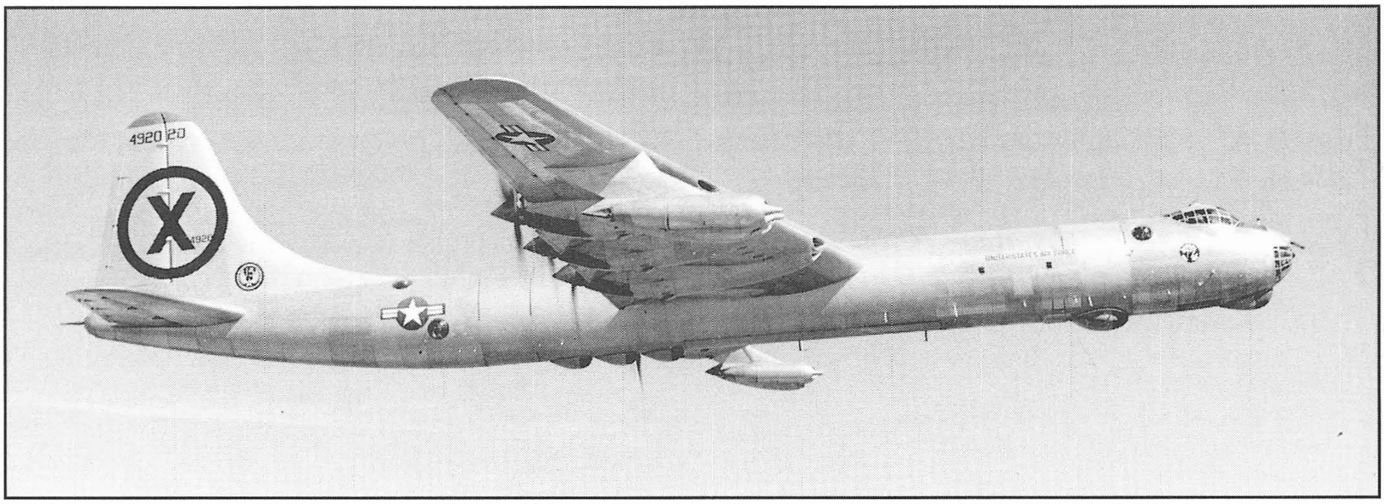


The RB-36H was representative of the accommodations and equipment carried by the RB-36s. The camera compartment (right) was installed in the location originally used by bomb bay No. 1, while the aft cabin (lower right) had two dedicated ECM stations and a rearranged tail gunner's position. Later configurations included three ECM/ferret stations in the aft compartment, and one up front. (U.S. Air Force)

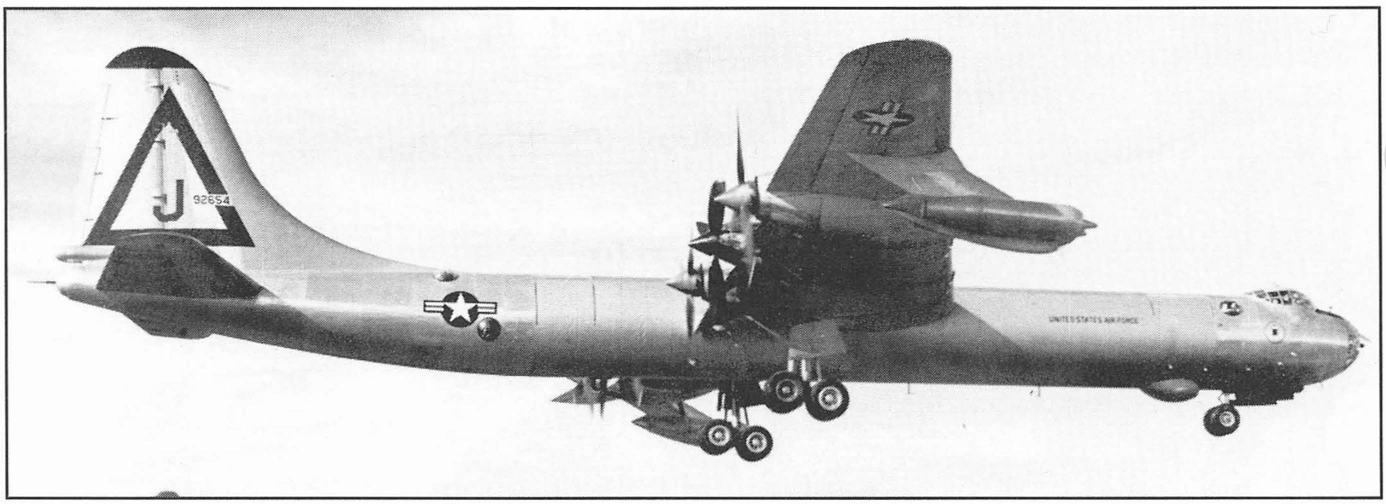
STATION	CAMERA	FOCAL LENGTH-INCHES	QUANTITY	USE
Trimetrogon	K-17C	6	3	Charting and Mapping
Vertical	K-17C, K-37, K-22A, or T-11	6, 12, or 24	1	Mapping, Intelligence, and Night Photography
Split Vertical	K-38	24	2	Mapping, Reconnaissance, and Intelligence
Multi	K-38 or K-40	36 48	5	Reconnaissance and Intelligence
Forward Oblique	K-22A	12	1	Reconnaissance and Intelligence
Left Oblique	K-22A	12 or 24	1	Reconnaissance and Opportunity
Right Oblique	K-22A	12 or 24	1	Reconnaissance and Opportunity
Photo-Navigator and Radar Observer	C-1		2	Radar Scope Photography
Photo-Navigator	A-6		1	Motion Picture Reconnaissance and Intelligence



The "Boston Camera" was the largest camera ever carried by an aircraft. It was tested on an RB-36 and C-97 but was not used operationally. (Terry Panopalis)



This RB-36E (44-92020) was assigned to the 72nd BW based at Ramey AFB, Puerto Rico, attached to the 5th SRW at Travis AFB. This photo was taken near Travis AFB in August 1952. (Warren Bodie via Richard Freeman)

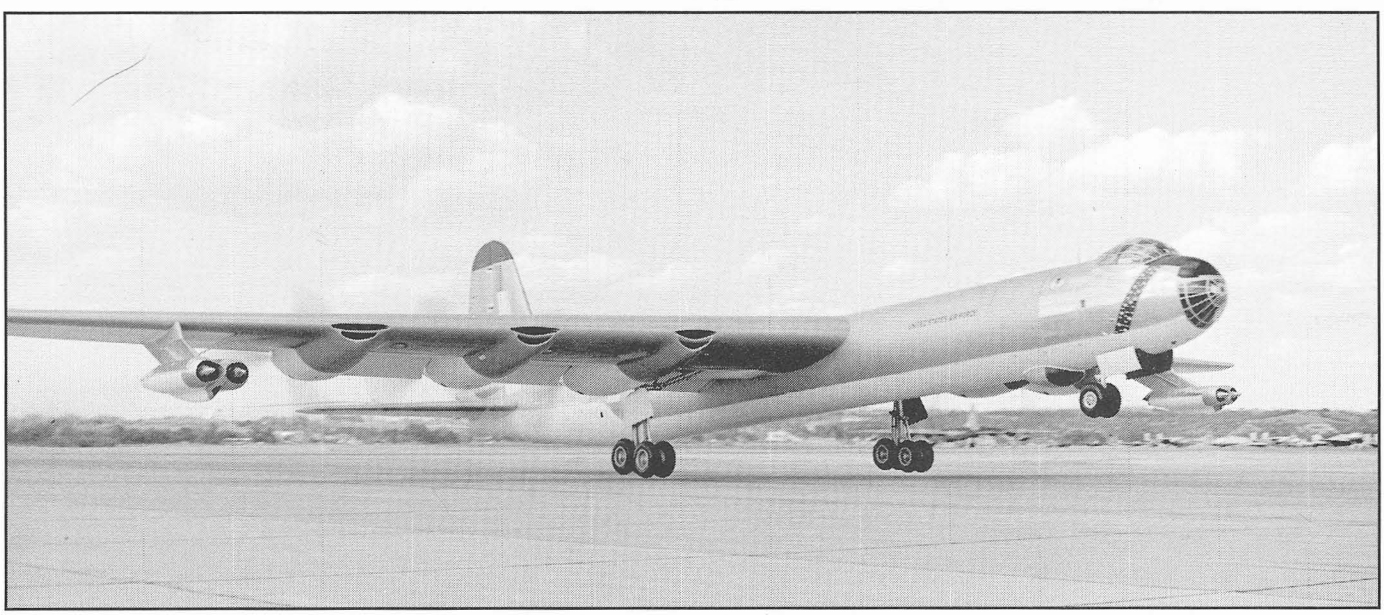


A B-36D-35-CF (49-2654) landing at Ramey AFB, Puerto Rico. (Norm Taylor Collection via Richard Freeman)

A B-36D (44-92065) assigned to the 326th BS/92nd BW, Fairchild AFB, Washington, in May 1955. (W. Balogn via the Norm Taylor Collection via Richard Freeman)

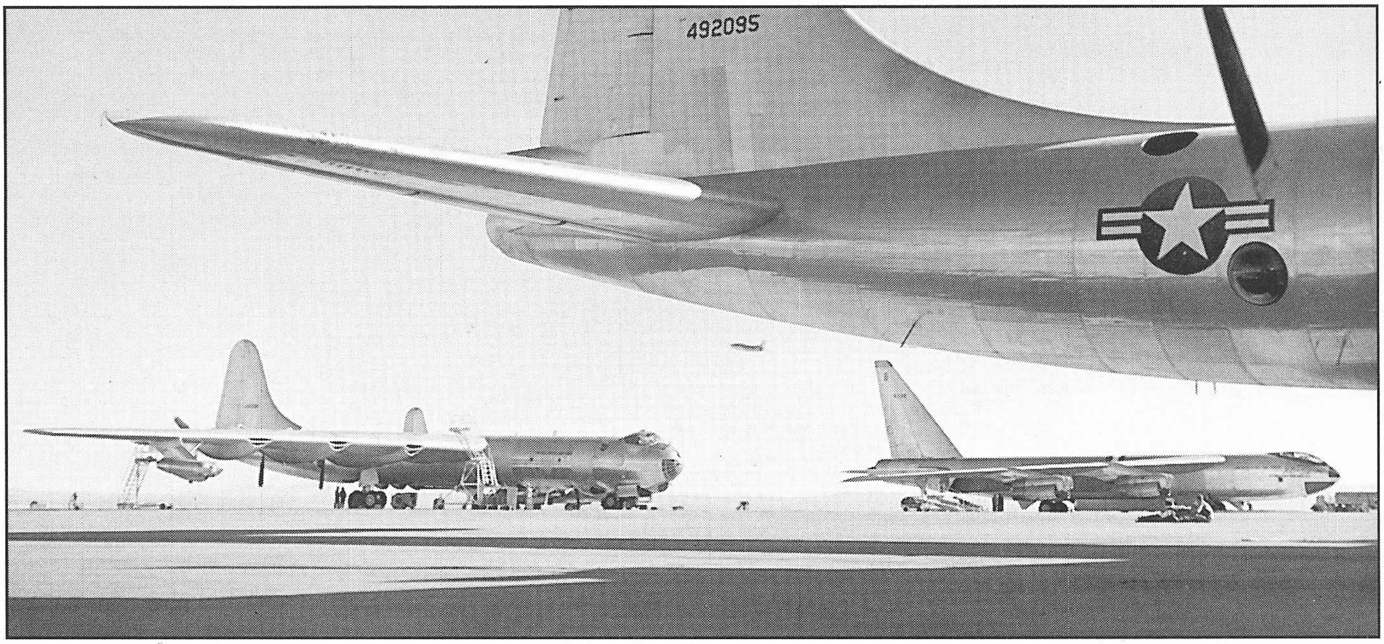
A B-36D (44-92037) assigned to the 70th BS/42nd BW based at Loring AFB, Maine. The photo was taken at Detroit MAP on 5 July 1955. The large U.S. AIR FORCE markings and lack of tail codes was representative of the markings in the later 1950s. (Norm Taylor Collection via Richard Freeman)

This RB-36E (44-92023) was assigned to the 72nd BS/72nd BW at Ramey AFB, and attached to the 5th SRW at Travis AFB. This photo was taken at Travis AFB in August 1952. (Warren Bodie via Richard Freeman)



The last B-36J takes off from Fort Worth on its maiden flight. The last 14 B-36Js were completed as Featherweight III aircraft without defensive armament. The last few aircraft were also finished with "anti-flash" white paint on the lower fuselage and wings to protect against the thermal flash of a nuclear explosion. (Convair via LMTAS/Mike Moore)

The first new-build B-36D (44-92095) was originally ordered as a B-36B, but was finished on the assembly line with jet engines and other improvements. (Convair via the San Diego Aerospace Museum)



A couple of B-36s meet their eventual replacement, the XB-52, at Edwards AFB. (Tony Landis Collection)

Magnesium Overcast

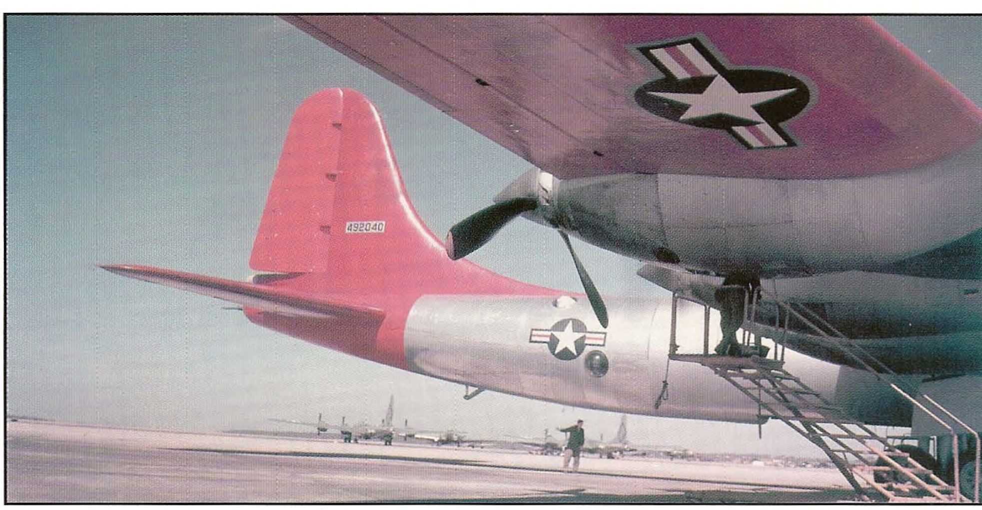
Colors of the B-36

Like most aircraft of the early Cold War, the B-36 served its entire career in natural metal finish. In the B-36's case, this meant a combination of dull magnesium and shiny aluminum. Some early aircraft that were assigned to bases in the Arctic had their wingtips and tails painted bright red – making it easier to find them if they were forced down in the hostile terrain.

There were some unit markings, but these were generally plain black – mainly triangles or circles on the tail in the old style bomber markings, and unit insignia on the nose. Occasionally a name made it onto the aircraft, but it could seldom be seen given the size of the fuselage.

The YB-60s and NB-36H had a little color in their markings, but neither made very many flights.

The notable exception to the plain markings were the two B-36Hs used during the atomic test programs. These aircraft actually dropped atomic and thermonuclear weapons, and were well photographed while they did so. To enhance the photography, each aircraft had its fuselage painted red, white, and blue. Unfortunately, only one photo could be found, and it is of less than ideal quality.

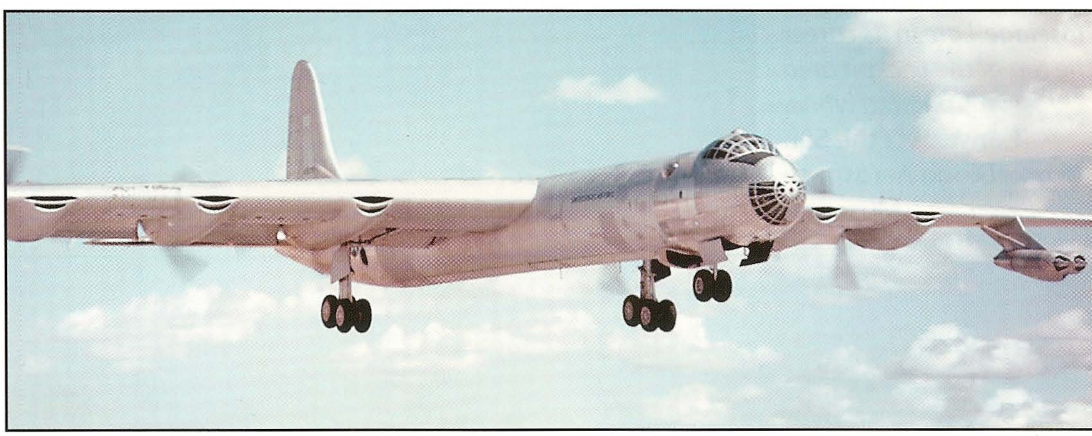


A lot of bright red paint was used to cover the wingtips and tails of the handful of B-36As and B-36Bs that used the northern bases. The red markings were intended to make it easier to spot the aircraft if they were forced down in the snow. (San Diego Aerospace Museum Collection)

The NB-36H atomic reactor test aircraft. At some point during its career it had the name "Crusader" in the blue strip on the nose. Note the radiation insignia on the vertical stabilizer. (Convair via LMTAS/Mike Moore)

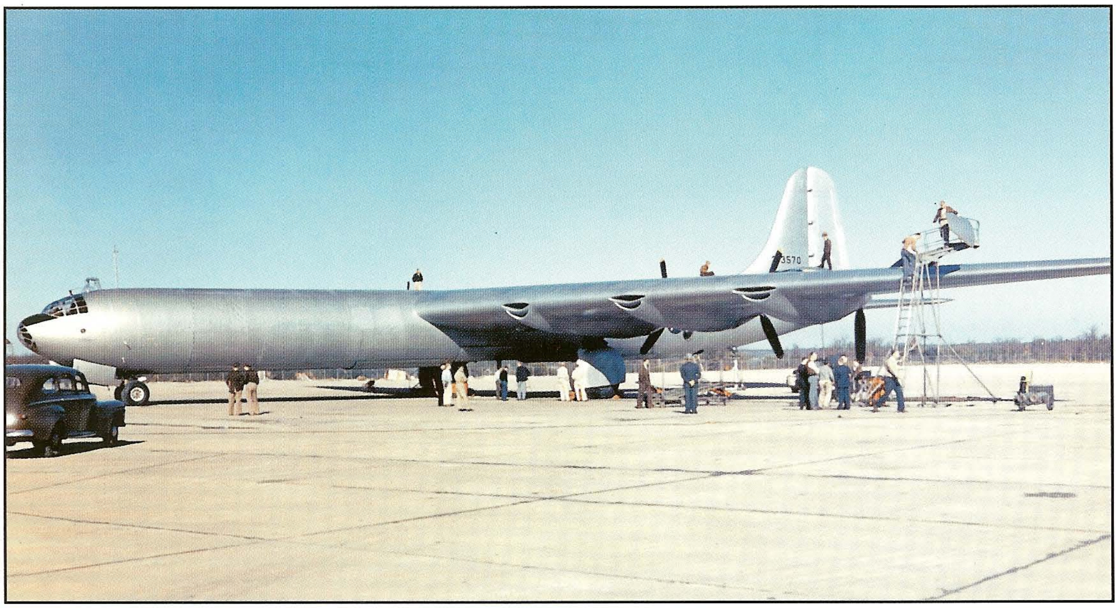
A partially completed B-58 airframe was airlifted from Fort Worth to Wright Patterson AFB by using a B-36 in much the same manner as the FICON project. The B-58 was a structural test article. The inboard propellers were removed from the B-36, and the entire flight was conducted with the landing gear down since the B-58's wing would have interfered with its retraction. (Convair via Peter M. Bowers Collection)

The TOM TOM aircraft had a couple of spots of color. Note the blue wingtip pods that housed the docking mechanisms, and the red test data boom on the nose. (Convair via LMTAS/Mike Moore)



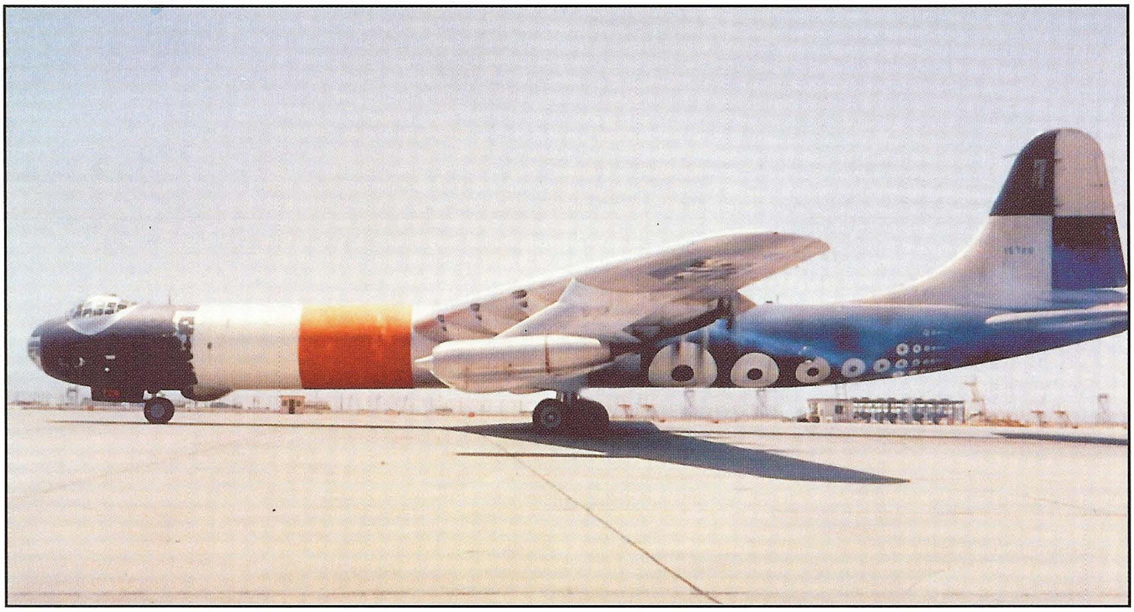
The standard natural metal used by most of the B-36 fleet for its entire career. There was little to externally differentiate most B-36 models. (Tony Landis Collection)

The B-36J at the Air Force Museum before it was restored and placed inside the new museum building. (Peter M. Bowers Collection)



The XB-36 was finished in overall dull silver with a standard World War II national insignia on the rear fuselage and a black serial number on the vertical stabilizer. (Convair via the San Diego Aerospace Museum)

The XC-99 used aluminum skin instead of the magnesium skin used on much of the B-36. A variety of small markings were applied to the vertical stabilizer over the years, and for a while a small XC-99 logo adorned the forward fuselage. Late in its career the top of the cockpit area was painted white. (Convair via the San Diego Aerospace Museum)



This paint scheme was applied to the two B-36Hs used to drop nuclear weapons over the Pacific and Nevada during the atomic test series. (via John Johnson)

TECHNICAL 5 WONDERS

DEFENSIVE AND OFFENSIVE ARMAMENT

The 1950s were a time of wonder. Advances in material and the birth of mechanical and electromechanical computers had opened entirely new avenues of research. The pace of change, when compared to even 20 years earlier, was incredible. The B-36s used several very state-of-the-art systems.

Defensive Armament

The defensive armament installed on the B-36 represented the ultimate expression of the self-defense concepts that came into being during World War II. Although most later bombers (through the Douglas B-66) would continue to include tail armament, the B-36 was the last that made extensive use of turrets to provide complete hemispheric coverage. After investigating many different turret configurations, it was decided to use a variation of the remote control turret (RCT) that had found its first extensive use on the B-29 and A-26 during World War II. General Electric continued to develop the concept, and was selected to develop an improved system for the B-36.

The basic B-36 defensive armament consisted of eight remotely-controlled turrets, each equipped with two 20-mm cannon. The nose and tail turret were nonretractable and provided limited coverage directly ahead and behind the aircraft. Six other turrets were located in pairs on the upper forward fuselage, upper rear fuselage, and lower rear fuselage. These turrets all retracted into the fuselage and were covered by flush doors when not in use. The turrets were designed to operate at altitudes up to 50,000 feet in temperatures between –50° and 122°F.[1] Each turret was operated electrically from a gunner's sighting position located apart from the turret it controlled.

The basic RCT system was composed of one sight, one turret, one thyratron controller, a signal system, an input resolver, a computer, and various controls to monitor and activate the system. The upper and lower fuselage turrets also had retracting mechanisms. The entire system was very dependent upon a constant and well-regulated electrical supply, and this was one source of early problems. Since all movement of the turrets and cannon was based on the differential voltage between two signals, each signal had to start from a very precise baseline. The voltage regulators in the late 1940s were not truly up to

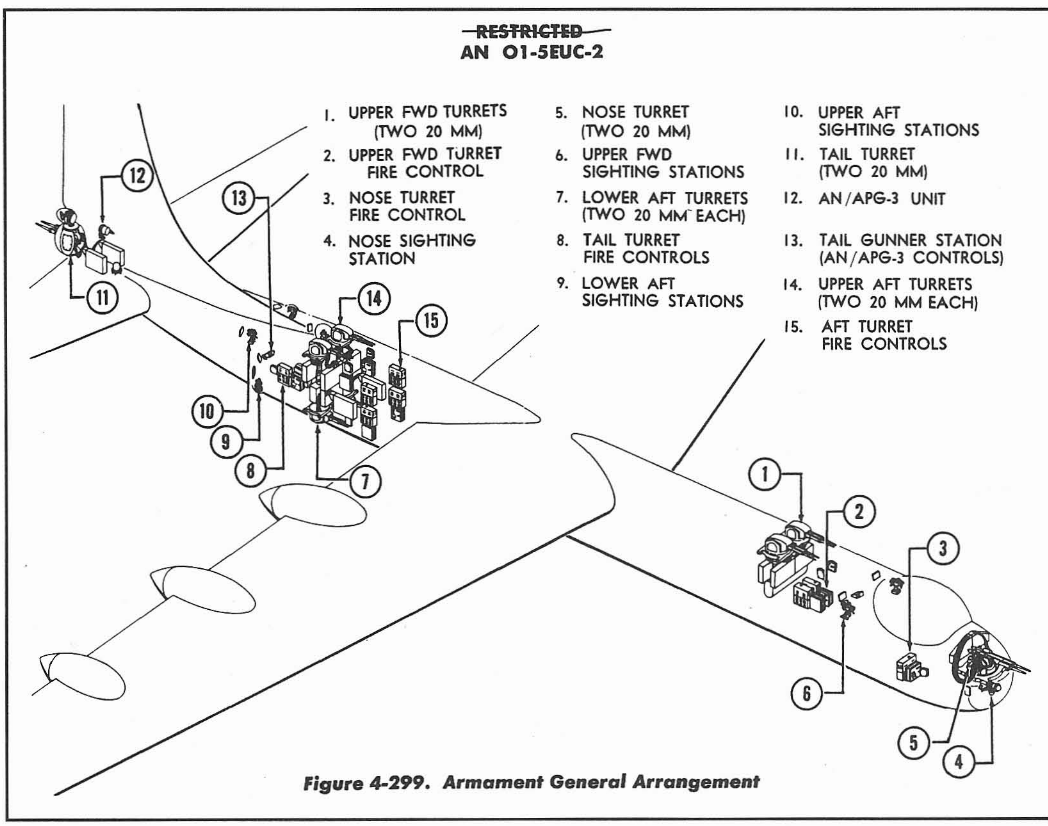
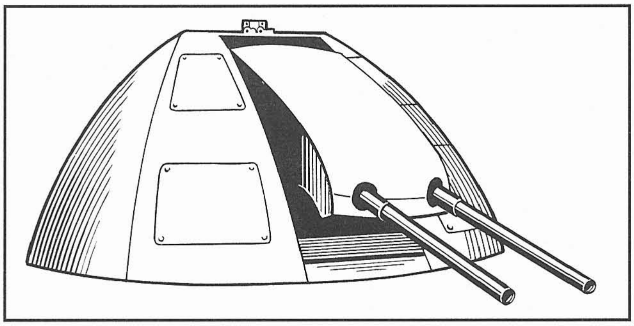
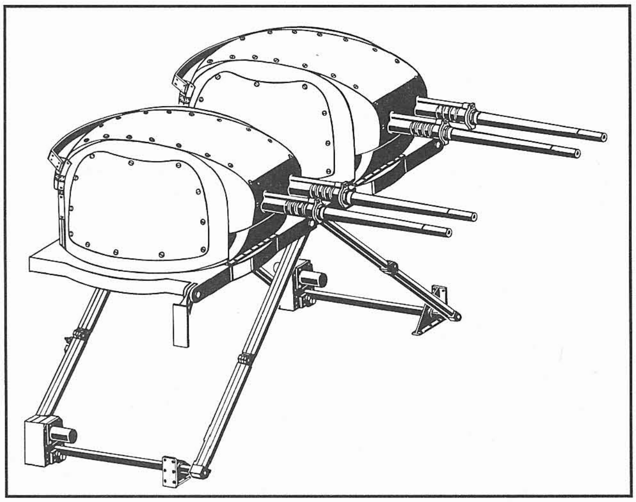


Figure 4-299. Armament General Arrangement

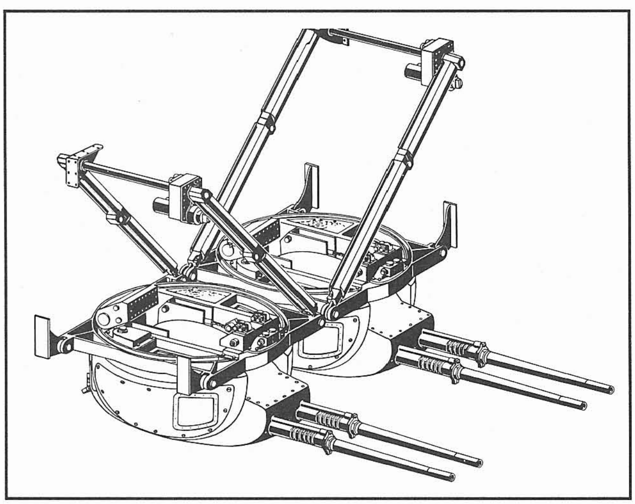
The remote-controlled turret system fitted to the B-36 was the most extensive defensive armament ever to equip an operational aircraft. (U.S. Air Force)



The nose turret was a late addition to the B-36, forcing a redesign of the entire nose section. (U.S. Air Force)



There were two sets of upper turrets located under sliding panels, one near the cockpit and one near the base of the vertical stabilizer. The turrets retracted by folding approximately 45° downward, hinged near the centerline of the aircraft. (U.S. Air Force)



The lower turrets were generally similar to the upper turrets. Originally there were to have been two sets of lower turrets, but the APS-13 and APS-23 search radar was installed in the forward lower turret bay in all B-36s. (U.S. Air Force)

the task, resulting in large errors in movement in early systems.

Unlike the sights in the B-29, which could be switched to control different turrets, each sight in the B-36 was dedicated to the turret closest to it. Four different types of sights were used on the B-36: yoke, pedestal, hemisphere, and tail.

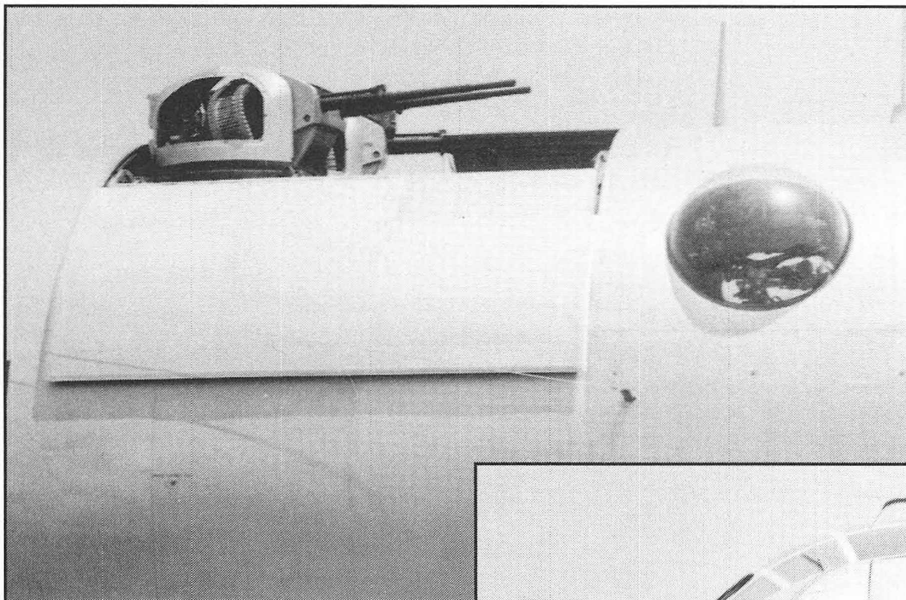
The yoke sights were located in the four upper sighting blisters and controlled the upper turrets. The yoke sight could be rotated in elevation from 90° above to 45° below horizontal, and in azimuth from 110° forward to 110° aft of broadside. The gunner tracked the target by manipulating the entire sight.

The pedestal sights were located in the lower blisters and controlled the lower turrets. The pedestal sight could be rotated in elevation from 45° above to 90° below horizontal, and in azimuth from 105° forward to 105° aft of broadside.

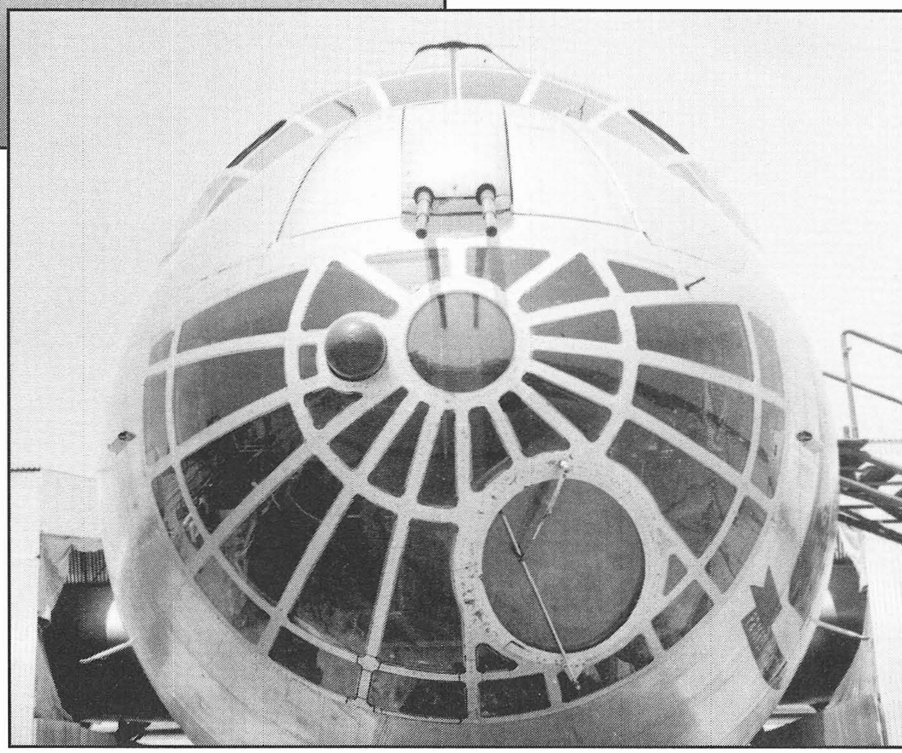
The yoke and pedestal sights had a small clear glass plate through which the gunner looked while aiming. When the sight was powered on, a view through the plate showed a center aiming dot surrounded by a circle of dots. By setting the attacking fighter's wingspan with the target dimension knob and framing the target correctly, the gunner supplied the range of the attacking fighter to the computer. At the same time the gunner was expected to track the fighter accurately and smoothly, providing azimuth, elevation, and relative speed (relative angular velocity) to the computer.

The hemisphere sight controlled the nose turret and was offset to the right side of the nose, below the turret. The sight was a horizontally-mounted, double prism periscopic sight designed to give the gunner a full hemisphere of vision. The gunner, without changing his position, could see 90° to the right or left of straight ahead, as well as 90° up or down from 0° elevation. The eyepiece of the sight was fixed, and the gunner controlled the turret by manipulating control handles immediately below the sight. Since the sight protruded from the nose of the aircraft into the airstream, a desiccating system was provided to keep the prism free of moisture and a heating unit prevented frosting.

The hemisphere sight operated on much the same principle as the yoke and pedestal sights, except



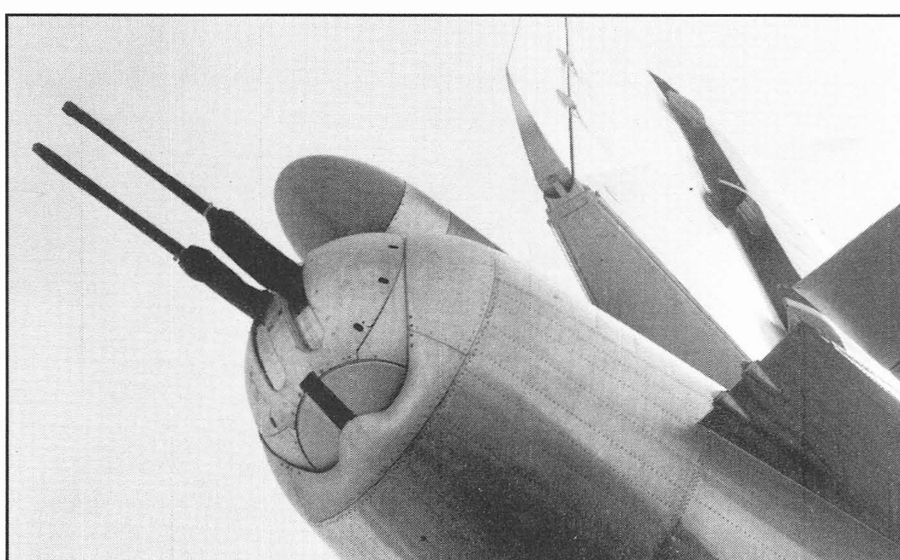
The upper forward turrets were located behind doors that slid down the outside of the fuselage to expose the turrets, creating a fair amount of drag in the process. (Peter M. Bowers)



The nose turret had limited travel, but could successfully defend from frontal attacks. The periscopic sight is offset to the left in this photo. (Peter M. Bowers)

the gunner sighted through a single eyepiece with one eye. A dummy eyepiece blocked the unused eye, and could be rotated to accommodate either right or left eye-dominant gunners.

The tail sight was a radar set which was controlled by a gunner facing rearward (for no particular reason) in the aft compartment (some RB-36s shifted the gunner facing left on the port side of the aft cabin). The *SAC B-36 Gunnery Manual* boasted that "The gun-laying radar is highly developed and unbelievably accurate." Three different gun-laying radars were used; the APG-3 in the B-36B was quickly replaced by the AN/APG-32A, while the AN/APG-41A was used later. The early sets used a single antenna, while the APG-41A used two antennas above the tail turret, although in some aircraft these were covered by a single elongated radome.



The tail turret of a B-36D. Later variants changed the gun-laying radar – the APG-41A had either two radomes, or a single elongated radome, depending upon the specific aircraft. (Peter M. Bowers)

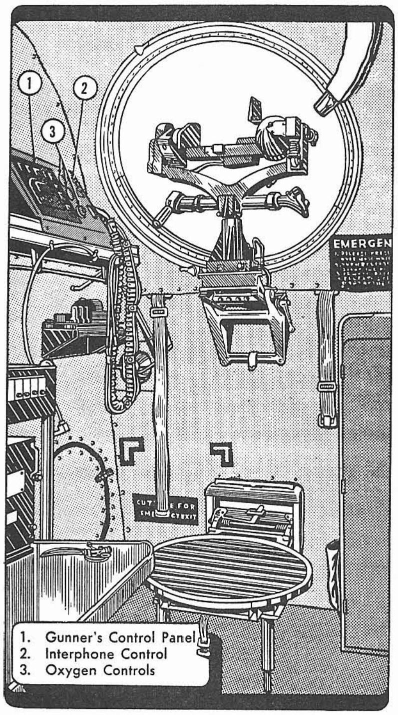


Figure 4-5. Typical Forward Sighting Station

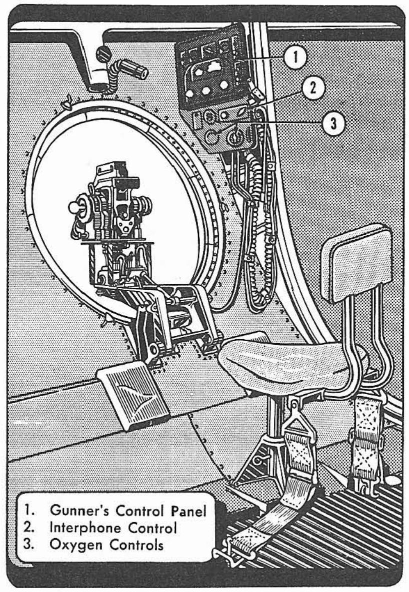
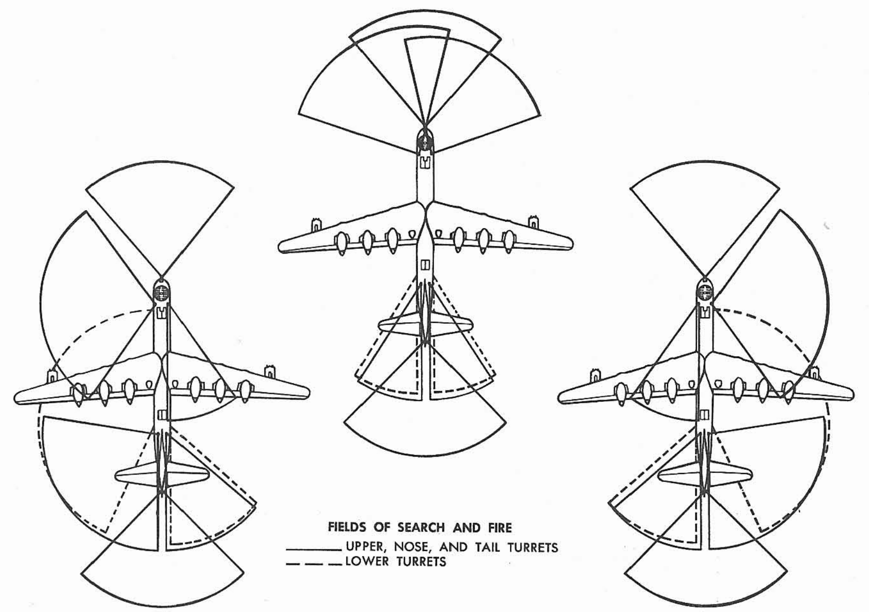


Figure 4-7. Typical Lower Aft Sighting Station

Typical upper sighting station (above) and lower sighting station (right) on the B-36B. Other B-36 models were essentially identical. Each sight could be equipped with a camera that was used mainly for training purposes. (U.S. Air Force)

Each of the turrets was equipped with two M24E2 or M24A1 20mm automatic cannon with a selectable rate of fire between 550 and 820 rounds per minute. Late in their careers the rate of fire was fixed at 700 rounds per minute for the tail guns and 600 for all others. Each gun weighed 100 pounds, was 77.7 inches long (52.5 inches of this was the barrel), and had a muzzle velocity of 2,730 feet per second. The nose turret had 800 rounds (400 per box), while all other turrets had 1,200 rounds (600 per box). The ammunition was pulled out of an ammunition box by an ammunition booster mounted on the box (except for the lower turrets and some nose turrets) and fed through ammunition chutes to the gun feeders. The lower turrets used gravity to feed the ammunition.

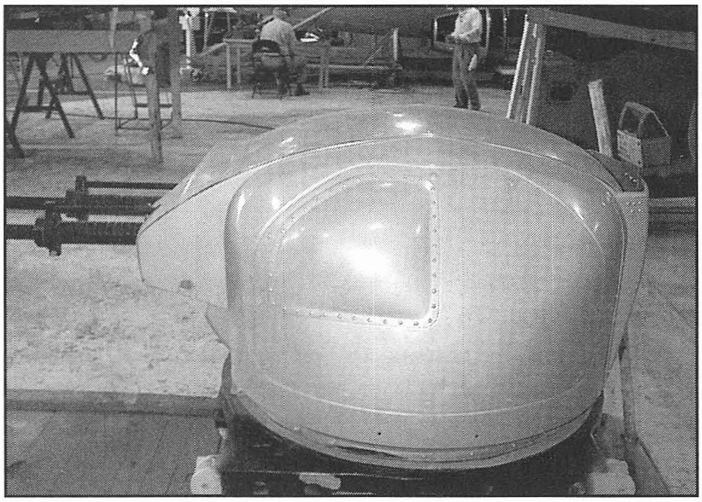


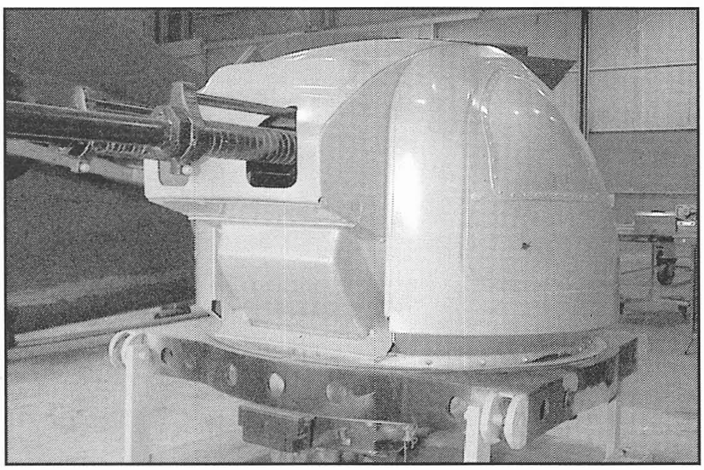
The HOMETOWN defensive fire formation. (U.S. Air Force)

Four different types of 20-mm ammunition were approved for use on the B-36: M97 high-explosive incendiary, M96 incendiary, AP1 armor-piercing incendiary, and AP-T armor-piercing with tracer. An M95 target practice round was also available, as was a "drill" round which could be used to practice loading and handling.

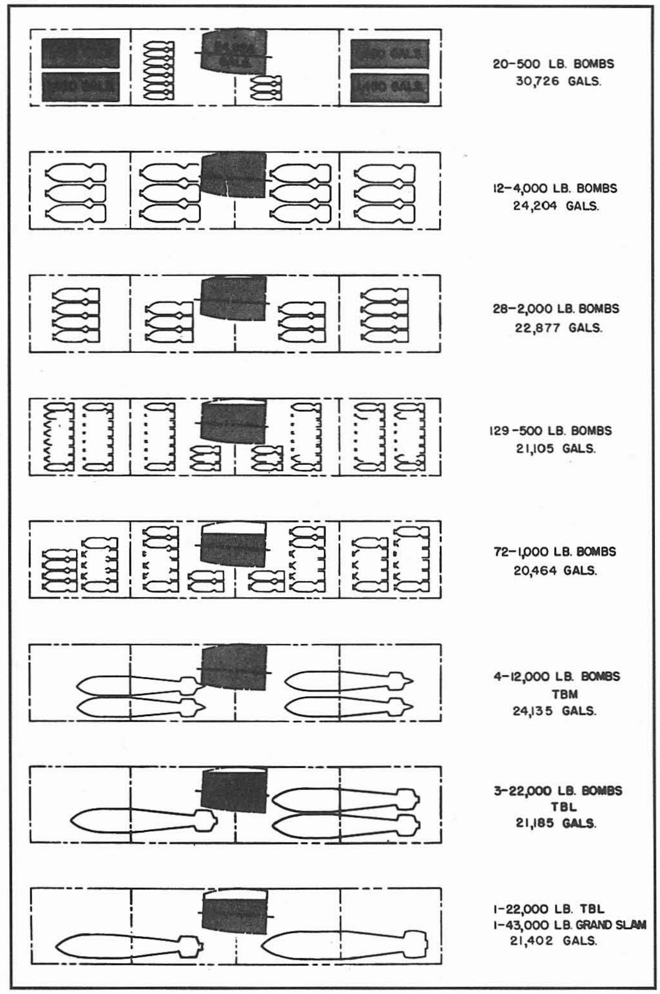
The retractable turrets were equipped with fire interrupters to prevent self-inflicted damage to the propellers, wings, or tail. The retractable turrets were also equipped with contour followers to prevent the guns from striking the aircraft, or pointing at parts of the aircraft housing personnel.

The upper and lower fuselage turrets were electrically retractable in order to reduce drag. Each turret was covered by a flush panel that slid down the outside of the fuselage when opened. Each turret could also be extended or retracted manually by means of a handcrank. The turrets were stowed in unpressurized compartments that could be entered in flight if required, and also served as a means of emergency escape during ground accidents





A turret from the Fort Worth B-36J restoration project. The aircraft at Fort Worth was manufactured as a Featherweight III, so it never was equipped with turrets.The restoration team nevertheless found one to display near the aircraft. (Aviation Heritage Association via Don Pyeatt)



The B-36 could carry bombs – lots of bombs. This drawing shows some of the possible conventional bomb and fuel configurations available to the B-36D. Unclassified handbooks and manuals of the era did not list nuclear weapons. (U.S. Air Force)

(explaining why many photos show the turret doors open during taxi).

SAC determined that a three-ship "V" formation provided the maximum defensive firepower. In this formation, the aircraft in the lead trained all of its turrets forward (the lower and upper aft turrets swiveled completely forward and provided upward and downward coverage). The aircraft on each side trained all of its turrets to that side. The exception, of course, was the tail turret that always faced aft. This plan left no area covered by less than two turrets (four cannon), and simplified coordination between the gunners. This formation was called HOMETOWN, and was the standard attack formation at altitudes under 35,000 feet.

Above 35,000 feet the importance of beam attacks was lessened since very few contemporary fighters could actually keep up with the B-36 at high altitudes. Consequently, the HOMETOWN areas of search and fire were modified to provide more protection to the rear. This TAIL HEAVY formation primarily involved training the lower aft turrets of all aircraft to the rear (and downward). At these altitudes it was expected that most attacks would come from below and rearward, although there was a chance of a fighter climbing to altitude and waiting for the bombers directly ahead.

There were, of course, other formations and tactics available to the bomber crews. Pretty much all of them centered around the same three-ship "V" formation, but modified the search and fire areas for each of the turrets.

Conventional Bombs

Interestingly, the *SAC B-36 Gunnery Manual* contained a fairly large chapter on bombs and bombing equipment. This was because "as a gunner, you have duties and responsibilities not directly concerned with flexibly gunnery ... you will assist [the bombardier] in the loading, fuzing, and arming of all bombs."

The B-36 was equipped with four large bomb bays. The B-36A and B-36B used electrically-operated two-piece doors that slid in tracks up the side of the lower fuselage. These doors were very slow to operate and created undesirable drag at a time when speed was of the essence. Beginning with the B-36D, the aircraft were equipped with hydraulically-actuated "snap-action" doors that opened in approximately two seconds. The B-36A/B models were retrofitted with the new doors as they were converted to RB-36Es and B-36Ds. Bomber-versions used two sets of doors approximately 32.5 feet long, each covering two bomb bays. Some reconnaissance versions had their doors divided in half, giving them four sets of 16-foot long doors (early models), or two sets of 16-foot doors (bomb bays No. 1 and 4), and one set of 32.5-foot doors (covering No. 2 and 3) on later models.

Reconnaissance versions carried a pressurized compartment in bomb bay No. 1 that housed up to 14 cameras, a darkroom for film processing, and the crew to operate and maintain the equipment. A special pallet that contained various ECM and ferret equipment could be carried in bomb bay No. 4, and was easily identified by the three large radomes protruding below the bomb bay doors. Later this equipment was moved into the aft fuselage compartment and the radomes were placed under the lower aft fuselage, freeing up bomb bay No. 4.

The B-36 was capable of carrying 67 different types of conventional, incendiary, cluster, and chemical bombs, as well as several types of mines. On the aircraft that had been modified to carry nuclear weapons, any airborne nuclear or thermonuclear weapon in the inventory could be carried. The B-36 was only aircraft that could do so. Only a single type of bomb could be carried in each bomb bay, although each bay could carry different types if necessary. The end bomb bays (Nos. 1 and 4) could carry a maximum of thirty-eight 500-pound bombs, nineteen 1,000-pound bombs, eight 2,000-pound bombs, or three 4,000-pound bombs. The two middle bomb bays (Nos. 2 and 3) were not as tall as the other two due to the wing carry-through structure, and could carry twenty-eight 500-pound bombs, sixteen 1,000-pound bombs, six 2,000-pound bombs, or three 4,000-pound bombs. Alternately, two 12,000-pound bombs, or a single 22,000-pound or 43,000-pound bomb could be carried in the combined bay 1/2 and bay 3/4. A por-

A 43,000-pound bomb being loaded into the combined bomb bay 1/2. (Convair via LMTAS/Mike Moore)

tion of the separating bulkhead could be moved to accommodate the larger bombs.[2]

Bombs weighing up to 4,000 pounds each were carried on 15 different types of removable bomb racks. The racks were mounted vertically along the sides of the bomb bay in the traditional style. Larger bombs used special slings instead of conventional suspension lugs and shackles. The 22 B-36As were not equipped to carry the larger bombs when they left the factory, although they received the capability when they were converted to RB-36Es.

An early attempt at a precision-guided weapon was the Bell VB-13 Tarzon. This was essentially a British 12,000-pound "Tall Boy" bomb fitted with forward and rear shrouds with control surfaces that allowed the bomb to be guided to its target. The 21-foot-long, 54-inch-diameter, free-falling weapon was tracked visually by means of a colored flare in its tail and guided to its target via an AN/ARW-38 radio link with the aircraft that dropped it. Development of the bomb had begun during World War II but had been halted when the war ended. The program was resurrected briefly in 1950, and 18 B-36Bs (44-92045/92062) were equipped to carry two Tarzons each, although it is unclear how often the weapon was actually dropped from the aircraft. Interestingly, the provisions for carrying and controlling the bombs were retained when the aircraft were converted to B-36Ds. Although the bombs did not see action with the B-36, approximately 30 Tarzons were dropped from B-29s during the Korean conflict, with eight of them destroying or damaging the bridges they were aimed at.

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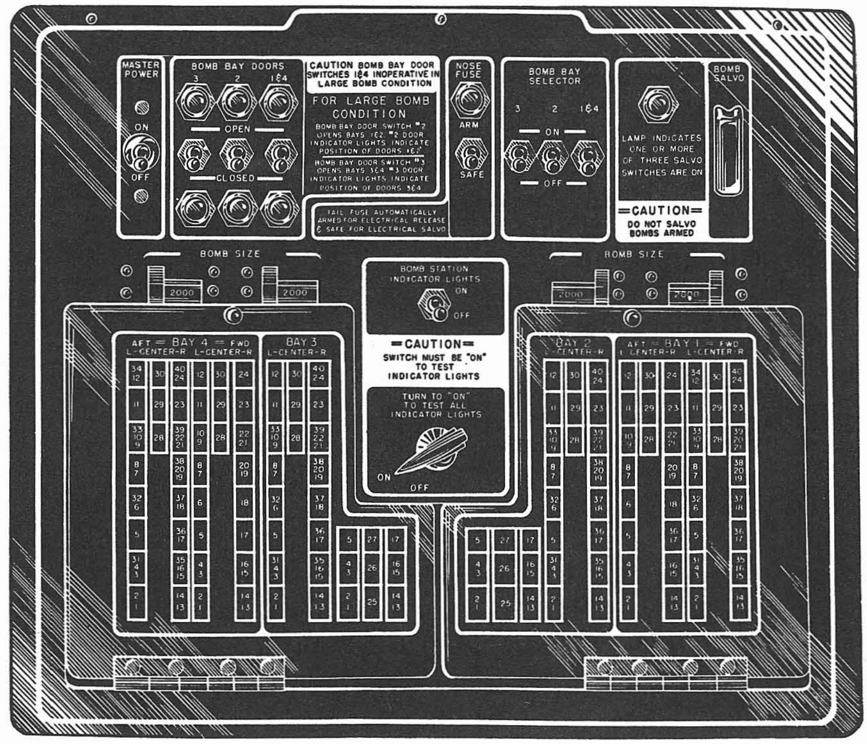


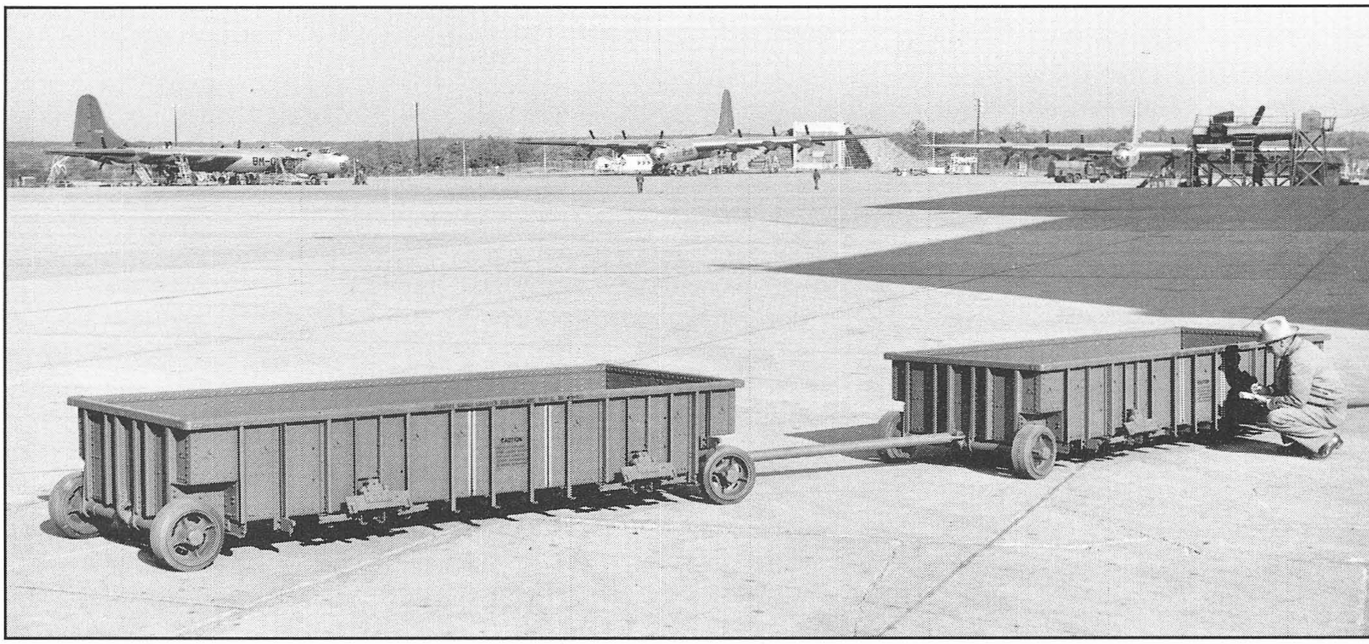
Figure 4-11. Bombing Control Panel

The bomb controls from a B-36B. Later models were similar. (U.S. Air Force)

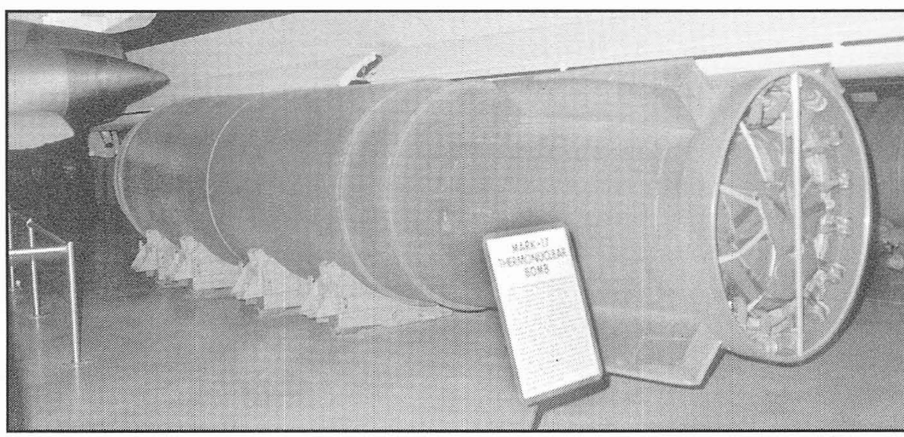
The maximum 86,000-pound bomb load carried by later B-36s is the heaviest ever carried by an American bomber. Even the "big belly" B-52Ds used during Vietnam could only carry 60,000 pounds (twenty-four 750-pound and eighty-four 500-pound), while the B-1B only carries 42,000 pounds (eighty-four 500-pound) of bombs (although its theoretical load limit is 75,000 pounds). As a point of reference, one of the most respected interdiction aircraft in the current Air Force inventory is the F-15E Strike Eagle. Fully loaded, with a maximum fuel and weapon load, the F-15E weighs 86,000 pounds – the B-36 could carry that amount of bombs!

Bomb bay No. 3 could carry a 3,000-gallon auxiliary fuel tank in all aircraft, and bomb bay No. 2 could carry one in some aircraft.[3] Some sources report that all four bomb bays in some aircraft could carry these fuel tanks, but this could not be confirmed through official sources.[4] Early auxiliary fuel tanks were interesting in that they were basically metal frames with a suspended fuel-proof "rubberized" canvas bag that contained the fuel.[5] The fuel cell was made by the Firestone Tire and Rubber Company. A later version of the fuel cell, manufactured by Goodyear, consisted of a rubber bladder inside a metal shell.

In a rather unique concept to assist the B-36 in deployments, both the ground power carts and a special cargo carrier were designed to be loaded into the bomb bays. Two cargo carriers were supplied by Convair with each aircraft, com-



Convair provided two cargo carriers with each B-36. Loose items could be loaded into the carriers, which in turn could be loaded into the bomb bay. Up to six carriers could be carried at one time. (Convair)



The largest thermonuclear weapon ever deployed by the United States was the Mk 17 (TX-17), which could only be carried by the B-36. (Terry Panopalis)

plete with wheels and tow bars to facilitate ground handling. Each cargo carrier could carry up to 14,000 pounds of loose items. Bomb bays Nos. 1 and 4 could each carry two of the cargo carriers, while the middle two bomb bays could each carry a single carrier.[6]

Atomic Bombs

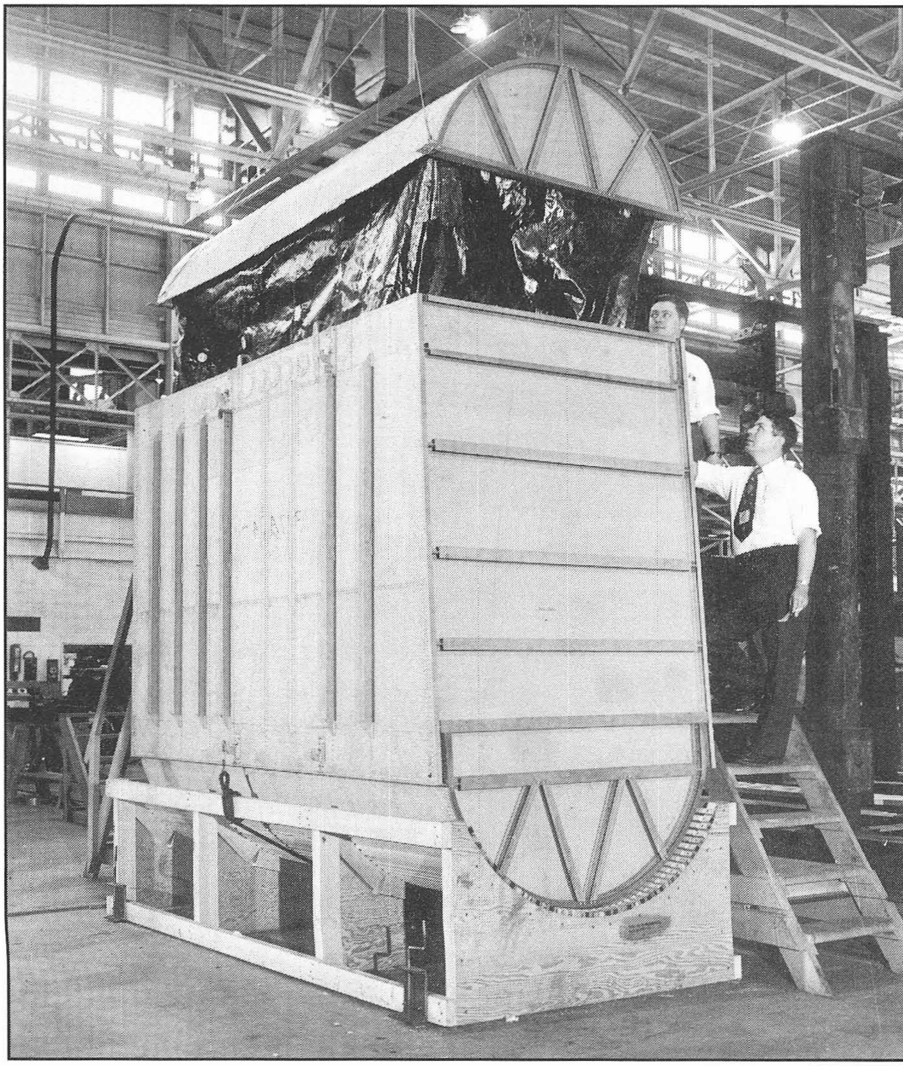
Interestingly, the B-36 was not designed to carry atomic bombs. But then, no other bomber had been so designed either. In 1946, only a few specially modified B-29s were capable of carrying the new atomic devices. Part of the reason the Northrop flying wings did not garner more support within the Air Force was that the XB-35 had bomb bays too small to accommodate the five-foot diameter, ten-foot long Mk 3 "Fat Man" or the new Mk 4. The bombs had to be carried semi-submerged, resulting in a 6% loss in top speed and a 10% loss in combat range. The B-29 (and the B-50) had bomb bays that could only accommodate weapons shorter than 12 feet long, eliminating carriage of bombs such as the 15-foot-long Mk 7.

Each nuclear bomb was designed without regard to the aircraft that might carry it. Each bomb also had a different center of gravity, sometimes radically different shapes, and required different suspension equipment and sway braces. This greatly complicated the design of aircraft bomb bays. The B-36 was impacted less by these problems than most aircraft simply because it was essentially a large tube – a very large tube. In the end it could be modified relatively easily to carry almost any size or shape bomb the designers could dream up. It was the only aircraft ever capable of carrying the first hydrogen bomb – the monstrous 25-foot-long, 42,000-pound liquid-fueled TX-17.

The components required to enable a bomber to carry early atomic weapons were relatively simple. A

special bomb suspension system was installed, along with the appropriate sway braces and suspension lugs. Electronic "T-boxes" controlled, tested, and monitored the bomb during flight, while arming controls and a method to insert the "capsule" that allowed the bomb to go critical were also required.

Projects GEM and SADDLETREE were the first efforts to convert B-29s and B-36s to carry the Mk 3 "Fat Man" type atomic bombs. Primarily this involved installing the appropriate suspension equipment and the T-boxes, although some general improvements to other systems were also made to improve the bombing accuracy of the aircraft. Between May 1947 and June 1948, 38 B-36s were modified to the SADDLETREE configuration. In addition to the ability to carry Mk 3 bombs, this included "winterization" and improved navigation systems to allow missions over the North Pole. By the end of 1950 SAC had 52 B-36s equipped with the GEM/SADDLETREE modifications, although at any given time many of these were out of service being modified.



One or more 3,000-gallon auxiliary fuel tanks could be loaded into the bomb bays to extend the range of the aircraft. (Convair via the San Diego Aerospace Museum)

In late December 1950, Project ON TOP modified yet more aircraft, this time to carry the Mk 4, Mk 5, and Mk 6 devices. At the same time the Air Force began the development of the universal bomb suspension (UBS) system that could be easily reconfigured to accommodate atomic weapons 15-60 inches in diameter up to 128 inches long. The UBS was to be installed in B-29, B-36, B-47, B-50, and B-54 aircraft. When used aboard the B-36, the UBS could support Mk 4, Mk 5, Mk 6, and Mk 8 atomic bombs, and Mk 15 and Mk 39 thermonuclear bombs. All of these modifications had resulted in the B-36 being able to carry a single nuclear weapon in bomb bay No. 1.

It was not until July 1950 that SAC decided B-36s should be able to carry more than one atomic weapon at a time. No less than three separate configurations evolved from this requirement as part of later phases of ON TOP. At least 30 aircraft (12 B-36Ds and 18 B-36Hs) were modified to carry the UBS in all four bomb bays. Other aircraft were modified to carry the UBS in bomb bay No. 1 and another weapon in bomb bay No. 4. Beginning in 1952 the RB-36s (all models) were modified to carry nuclear weapons in bomb bay No. 4. The factory began to equip aircraft to carry atomic weapons beginning with the B-36F. By the time the B-36H began to roll off the production line, they could carry the UBS in two bomb bays. It was a confusing time.

In 1951 the configuration of the first hydrogen bomb was largely frozen. At six feet in diameter, 20 feet long, and weighing 50,000 pounds, only the B-36 was capable

of carrying it. Project CAUCASIAN modified four B-36Hs to carry this gigantic weapon as part of the live fire tests. Unlike the modifications required for the atomic bombs, the H-bombs required structural modifications to the main wing spar to support the heavier loads. The original thermonuclear devices (TX-14 and TX-16) were fueled with cryogenic orthohydrogen, and Project BARROOM equipped the CAUCASIAN B-36Hs with the necessary fittings and piping necessary to support them.

After the devices were proven during the Operation CASTLE atmospheric tests, a high priority program was undertaken to modify B-36s to carry production (called "stockpiled" by the AEC) versions of the weapons. By the end of 1953 there were 20 B-36s equipped to carry thermonuclear bombs; by the middle of 1955 there were 208 aircraft. CASTLE had demonstrated the devices were capable of yielding the equivalent of 13.5 megatons, and the production Mk 17 yield was estimated at 20 megatons – the most powerful weapon ever deployed by the United States, and only deliverable by the B-36.

The B-36 actually dropped both nuclear (atomic) and thermonuclear weapons during the test series in the Pacific and Nevada. Various other B-36s were used as "sampler" aircraft to measure the radiation released from the tests, and "effects" aircraft to measure overpressures. It was a dangerous job. The Bravo shot during Operation CASTLE resulted in significant damage to the "effects" B-36D (49-2653). The aircraft experienced a 100% overpressure load, resulting in bomb bay doors buckling, the lower radome being pushed in about seven inches, and serious cracks and dents on the nose gear doors, main gear doors, all six engine nacelles, aft lower turret doors, and the lower aft sighting blisters. In addition several access doors were blown off and paint was blistered all over the aircraft. After its use in CASTLE, the aircraft was returned to Fort Worth where it was later scrapped.

Information gathered during the tests resulted in a B-36 delivery handbook being developed. The

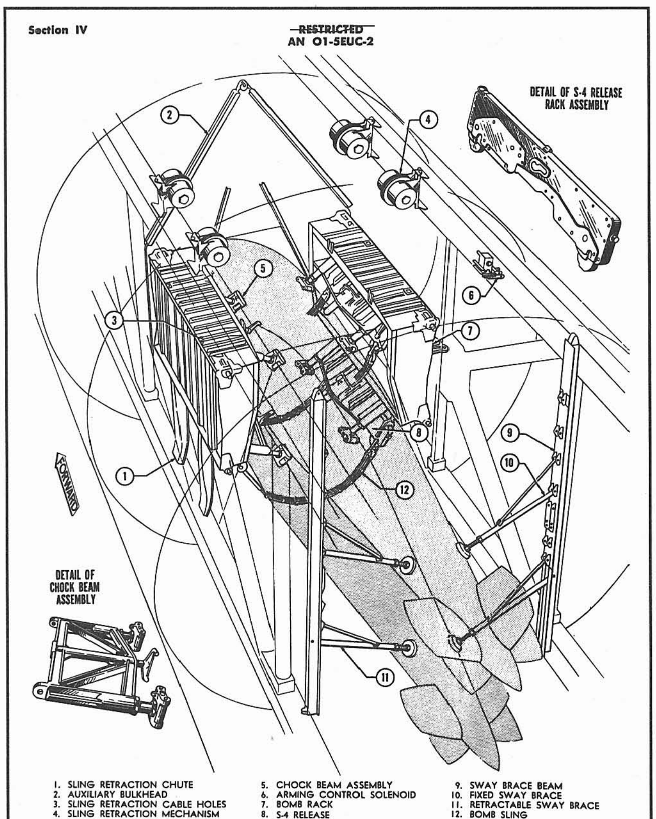


Figure 4-291. Large Bomb Loading Bays 1 and 2

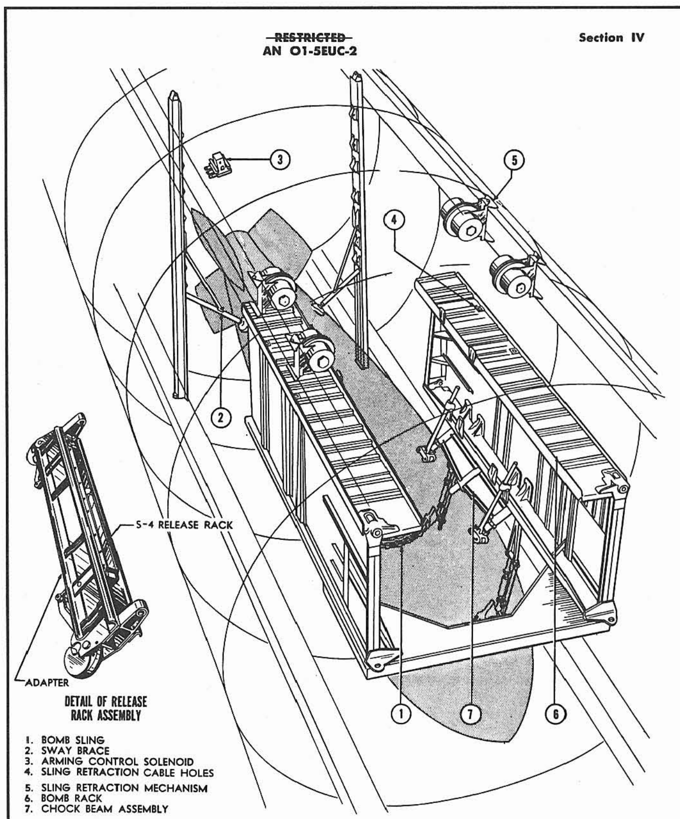


Figure 4-292. Large Bomb Loading Bays 3 and 4

The size of the bomb bays in the B-36 allowed the aircraft to carry any bomb in the inventory. Large bombs were carried on slings suspended between bomb racks instead of the more traditional suspension lugs and shackles. Sway braces ensured the bombs did not move during flight. (U.S. Air Force)

preferred delivery flight began at 345 knots at 40,000 feet (about the maximum speed possible), followed by a violent turn away from the target immediately after the weapon was dropped. It was estimated that the aircraft could survive a surface burst from a 10.8 megaton free-fall or 100 megaton parachute-retarded bomb (there were no 100 megaton bombs actually developed). If the bomb was set to explode at 6,000 feet, these figures dropped to 1.5 and 35 megatons, respectively.

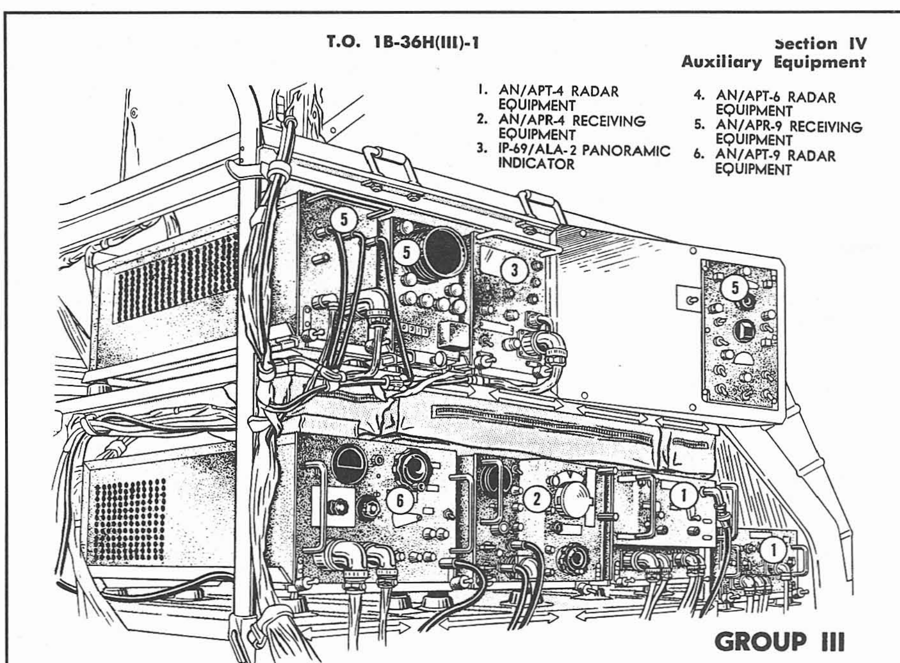
Electronic Countermeasures

One crucial advantage held by the B-36, and later the B-52, was that its size and load-carrying capacity gave it a great deal of room in which to incorporate new equipment. The first operational B-36s were equipped with essentially the same limited ECM equipment as contemporary B-29s. The radio operator served as the additional duty ECM operator, as in the B-29. During 1951, B-36s flew test missions at Eglin AFB to evaluate the effectiveness of the ECM and chaff systems, with results that indicated the B-36s could successfully penetrate existing radar defenses. Earlier tests against Royal Air Force night fighters equipped with airborne intercept radars had proven ineffective against B-36Bs equipped with their standard ECM suite. The B-36's best defense was a combination of high altitude and ECM.

As most aircraft were delivered from Convair, they contained racks and antenna mounting locations for various ECM equipment. The aircraft maintenance manuals stated that "tactical organizations will supply and install the ECM equipment." Surprisingly, although the ECM equipment was not provided with the aircraft, the numerous antennas were, although they were stowed in plywood boxes in the aft compartment and one of the cargo carriers. The antennas were installed by whatever organization supplied the ECM equipment itself.[7]

Initially the ECM equipment for the bomber versions (the RB-36s carried more extensive ECM equipment) consisted of two configurations known as Group I and Group II, depending upon the frequency coverage desired. Group I consisted of two AN/APT-4 transmitters that covered approximately 200-800 MHz (called megacycles at the time). Group II substituted an AN/APT-1 transmitter for one of the APT-4s, extending coverage down to 90 MHz. In both cases a pair of AN/APR-4 receivers were installed, covering approximately 40-1,000 MHz. This equipment would be significantly expanded on later bomber versions as electronic warfare became increasingly important. For instance, the AN/APT-5A transmitter capable of covering 300-1,500 MHz was later added. By late 1954, a Group III had been developed that included the APR-4 and APT-4, an IP-69/ALA-2 panoramic receiver, AN/APT-6 transmitter, AN/APR-9 receiver, and AN/APT-9 transmitter.[8]

The reconnaissance versions carried yet more ECM equipment, although some of it was actually "ferret" equipment designed to record and analyze enemy radio and radar transmissions. Most early RB-36s had three large radomes protruding from bomb bay No. 4, and a pallet in that bomb bay contained most of the electronic equipment. Control stations were installed in the aft compartment. A similar radome was fitted to the extreme forward fuselage immediately behind the glass nose. When SAC directed that the Featherweight RB-36s should have expanded bombing capabilities, the ECM/ferret equipment was relocated. The radomes were relo-



The Group 3 ECM equipment from a B-36H Featherweight III. (U.S. Air Force)

cated to under the rear fuselage, and most of the electronic equipment was installed in the compartment previously used by the aft turrets. This freed bomb bay No. 4 to again carry bombs.

On the GRB-36D FICON aircraft, a single AN/APX-29A IFF/rendezvous set was installed. The antenna was located under a large radome on top of the forward fuselage, and proved to be one of the more recognizable features of the GRB-36D. The APX-29A allowed the RF-84K fighter to easily locate the waiting bomber when returning from a mission.

Late B-36Hs added an AN/APS-54 radar warning receiver to tell the tail gunner if the aircraft was being illuminated by a surface or airborne radar. The APS-54 was a wide-band crystal video RWR that was effective from 1-10 GHz. The system provided limited azimuth data – basically indicating if the threat was ahead-of or behind the B-36. One problem was that the APS-54 could be easily damaged if it was illuminated by the APS-23 search radar of a nearby B-36. This was the first "modern" RWR to enter service with SAC, and quickly became standard equipment on most SAC bombers.

Modernization of the ECM equipment was a large part of the Featherweight program, and its $30,000,000 price tag included several significant equipment additions, such as the APS-54 radar warning receiver, two low frequency radar jammers, and a new AN/APT-16 S-band jammer. The alterations also included the addition of another ECM operator position, so that there were individual crew positions for crew members operating low, intermediate, medium, and high frequency equipment. The manual A-7 chaff dispenser was replaced by the automatic ALE-7 dispenser on most aircraft.

[1] SAC Manual 50-30, *B-36 Gunnery*, November 1954. [2] AN 01-5EUB-1, *Flight Operating Instructions for the USAF Series B-36B Aircraft*, 16 November 1949, p 94. [3] *Ibid*, p 13. [4] Aviation Week, 12 September 1949, p 37. [5] AN 01-5EUC-2 (1B-36D-2), *Erection and Maintenance Instructions, USAF Series B-36D Aircraft*, 3 June 1954, p 637. [6] Aviation Week, 18 October 1948, p 12. [7] AN 01-5EUC-2 (1B-36D-2), *Erection and Maintenance Instructions, USAF Series B-36D Aircraft*, 3 June 1954, p 519. [8] 1B-36H(III)-1, *Flight Handbook for the USAF Series B-36H-III Aircraft*, 26 November 1954, p 229.

1. The RB-36 aircraft contains four ECM positions.

The frequency range covered in each position is as follows:

Low Frequency Position	38 to 300 mc
Intermediate Frequency Position	300 to 1,000 mc
Medium Frequency Position	1,000 to 4,400 mc
High Frequency Position	4,400 to 11,000 mc

2. The Low Frequency Position

The Low Frequency position is located in the forward pressurized compartment directly behind the flight engineer's pedestal. This is a combination Radio Operator and ECM operator position and all the normal radio operator's equipment is also installed in the racks facing the operator. ECM equipment installed in this position is as follows:

1	ARR-5	Communications Search Receiver
2	APR-4	Radar Search Receiver
1	TN-16	Tuning Unit (38 to 95 mc)
1	TN- 17	Tuning Unit (74 to 320 mc)
1	ARR-8	Panoramic Receiver
1	APA-74	Pulse Analyzer
1	APA-17	Direction Finder Equipment
1	AS-370	Low Frequency Antenna System
2	ANQ-1	Wire Recorder
1	O-15	Radar camera

The operator may select the audio output of any receiver individually or may select the mixed outputs of any combination by the use of toggle switches.

The non-directional (search) antennas are installed in pairs, one on the right and one on the left side of the aircraft. The inputs of each pair of antennas are fed to a balance and then to the receiver. With this antenna hook up, the LEFT-RIGHT system of determining on which side of the aircraft signals are being received is not possible. The APA-17 DF system is connected to the APR-4 TN-17 combination through a search DF switch.

The AS-222 DF antenna (20 to 250 mc) is mounted in a dome directly under the nose of the aircraft.

All antenna switching for this and all the other ECM positions of the aircraft is done by electrically operated RF switches controlled by toggle switches located on the ECM panel at each position.

This position contains a single seat and it is probable that the low frequency ECM operator will also be the radio operator.

3. Intermediate Frequency Position:

This position is located in the rear pressurized compartment. The equipment is located on racks mounted against the rear bulkhead on the right side of the aircraft. The operator sits facing aft. The equipment installed in this position is as follows:

1	APR-4	Radar Search Receiver
1	TN- 18	Tuning Unit (300 to 1,000 mc)
3	ARR-8	Panoramic Receiver (three ranges, total coverage, 300 to 1,000 mc)
1	APA-64	Pulse Analyzer
1	APA-17	Direction Finding Assembly with AS-108 antenna
1	ANQ-1	Wire Recorder
1	O-15	Radar Camera

The operator in this position may select either DF or search antenna operation by means of a toggle switch. The DF antenna is located underneath the aircraft at the rear bomb bay section. The doors have been removed from this bomb bay and replaced by permanently closed stressed skin.

4. Medium Frequency Position

This position is located in the rear pressurized compartment. The equipment is located on racks mounted against the rear bulkhead on the left side of the aircraft. The operator sits facing aft. The equipment fitted in this position is as follows:

1	APR-9	Radar Search Receiver
1	TN-128	Tuning Unit (1,000 to 2,600 mc)
1	TN-129	Tuning Unit (2,300 to 4,450 mc)
1	APA-17	Direction Finding Assembly with AS-186 antenna
1	APA-74	Pulse Analyzer
1	ANQ-1	Wire Recorder
1	O-15	Radar Camera

The operator in this position selects either DF or search antennas by means of a toggle switch on the panel at his position. He may also select either the TN-128 or TN-129 tuning unit by means of a toggle switch mounted on the panel in this position. This switch controls a remotely operated switching unit which is located in the rear bomb bay compartment.

The DF antenna is located underneath the aircraft at the rear bomb bay section. Due to the fact that the RF cables between the antenna and the RF units must be kept as short as possible, the RF units are located in the rear bomb bay section.

5. High Frequency Position

This position is located in the rear pressurized compartment. The equipment is mounted on racks against the left side of the aircraft just forward of the lower left gunner's blister. The operator sits facing the left side of the aircraft. The equipment in this position is as follows:

1	APR-9	Radar Search Receiver
1	TN-130	Tuning Unit (4,150 to 7,350 mc)
1	TN-131	Tuning Unit (7,050 to 10,750 mc)
1	APA-74	Pulse Analyzer
1	APA-17	Direction Finding Assembly with AS-247 antenna
1	O-15	Radar Camera

The operator may select DF or search operations by means of an RF switch remotely controlled by a toggle switch on the control panel. He may also select either tuning unit, TN-130 or TN-131 by means of a remotely controlled switching unit. The toggle switch controlling this unit is located on the operator's panel.

The TN-130, TN-131 and the switching unit are all located in the rear bomb bay compartment. The DF antenna is located underneath the rear bomb bay compartment.

6. Noise Jammers

1	ARA-3 communications jammer (2 to 18.1 MHz)
1	ARQ-8 (25 to105 mc)
1	APT-1 (93 to 210 mc)
1	APT-4 (160 to 800 mc)
1	APT-5 (300 to 1,625 mc)

By 1953 the RB-36 fleet carried four ECM/ferret operators, with equipment as listed above. This chart is derived from "A Guide to Airborne Electronic Countermeasures," prepared by the ECM Flying Training School at Barksdale AFB, Louisiana. (U.S. Air Force)

Odds and Mods

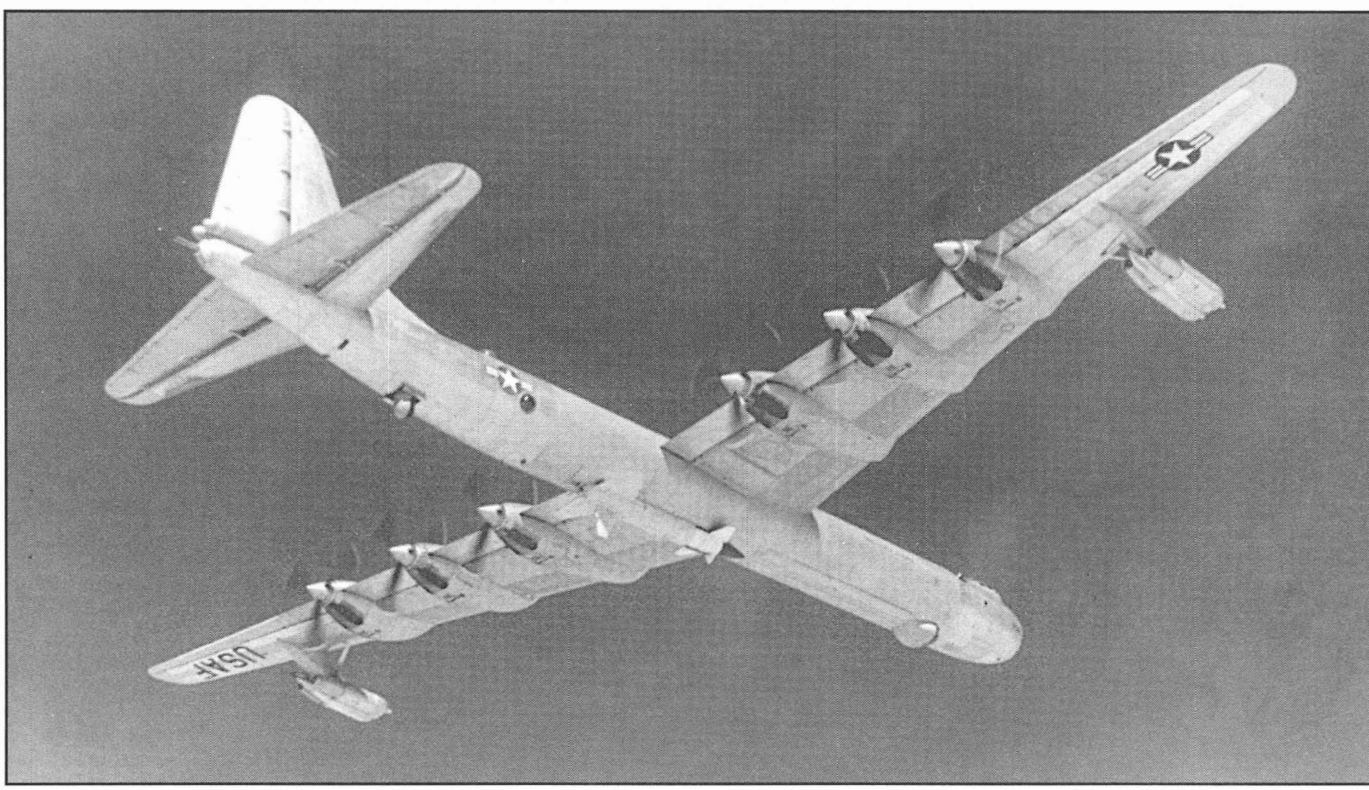
A Host of Experiments

The 1950s were also a time of great experimentation. The Air Force was constantly exploring new technologies and new concepts to improve its war-fighting capability. The B-36 centered prominently in some of these experiments, several of which actually made it into operation.

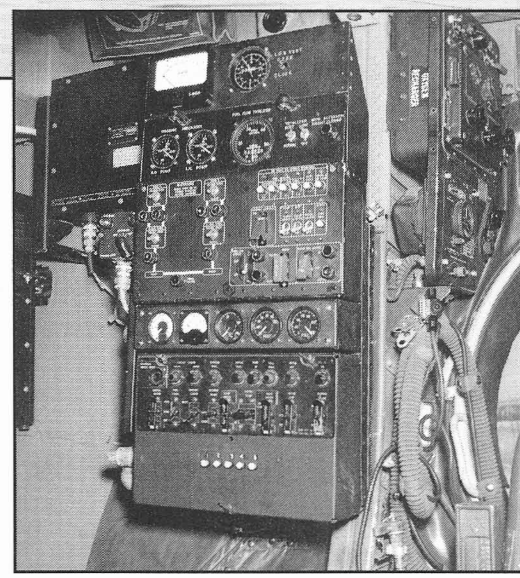
Featherweights

In February 1954 the Air Force approved the first of three phases of the Featherweight program to increase the operational altitude and range of the B-36. Phase I was a general weight reduction that simply deleted unnecessary items such as unused brackets, etc. All aircraft went through this "housekeeping." Phase II (also known as "Partial Featherweights") began to delete such things as crew comfort items, reduced some safety equipment, and minimized the number of spare parts and tools carried aboard the aircraft. This program was also applied across all types of B-36s, and the aircraft generally had a "-II' appended to their designation (i.e., B-36D-II).

The ultimate Featherweight was Phase 3 ("Full Featherweights"). Under this program all defensive armament except the tail turret and radar was deleted, and the forward and upper aft sighting blisters were deleted. The lower aft blisters were retained on most aircraft since they provided a convenient location for crewmembers to observe the engines for oil leaks, etc. On some aircraft these blisters were replaced by flat plexiglass, providing a small decrease in drag. Most of the remaining crew comfort equipment was also deleted. Without guns, the crew could be reduced, usually by two to five (remember that the forward gunners generally had other duties, such as navigating). These aircraft had a "-III' appended to their designations (sometimes written as "(III)" – B-36J-III or B-36J(III) – being equivalent).



The only known inflight photograph showing a RASCAL missile under a DB-36H. Note the retractable missile director under the rear fuselage. (Convair via Richard Freeman)



The only known photo of "TANBO 14," the tanker version of the B-36. Here the aircraft is undergoing "hydraulic tests" most likely related to its refueling equipment. Externally there was nothing to distinguish the aircraft from a normal B-36H. On the inside, the operator used the control panel at right to monitor the refueling. (Convair via LMTAS/Mike Moore)

The last 14 B-36Js were manufactured to the Featherweight III configuration, while many earlier aircraft of various models were converted in the field.

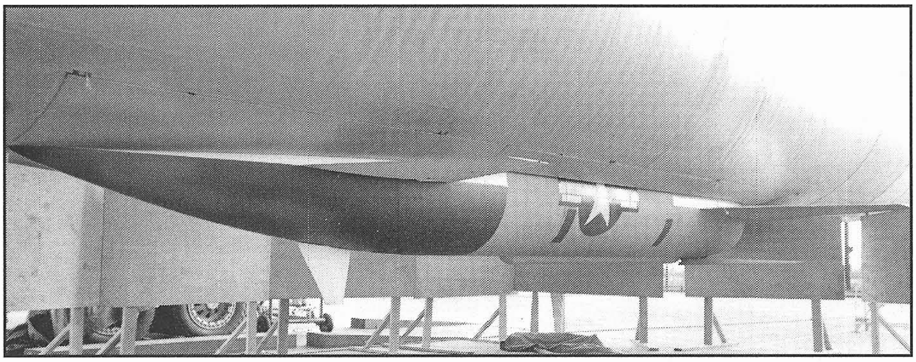
The modifications were successful. Not only did the third phase significantly improve the reliability of the aircraft since many troublesome components were removed (all the gunnery computers, sights, etc.), the maximum altitude of the aircraft was greatly increased. Officially the Featherweight IIIs could cruise at 47,000 feet, but missions as high as 51,000 feet were conducted.

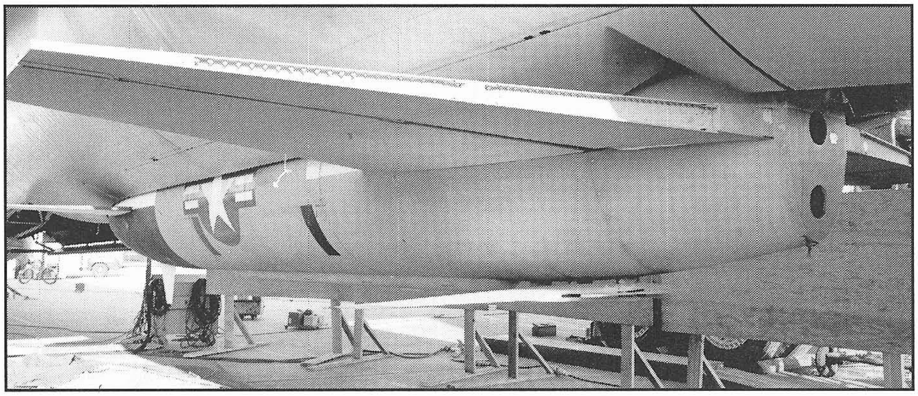
TANBO 14

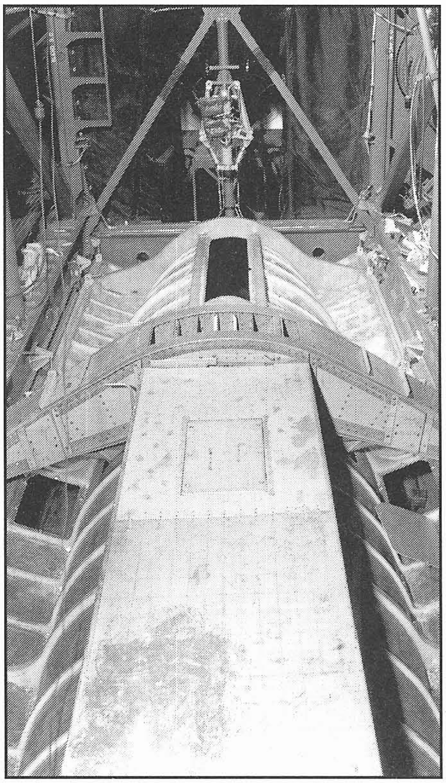
As early as April 1948 both Convair and the Air Force had expressed interest in using the B-36 as a tanker to refuel the new jet-powered medium bombers (B-47) being procured by the Air Force. A single B-36H (51-5706) was converted into an in-flight refueling tanker. Searching for a tanker that could refuel jet aircraft at higher altitudes and speeds, in early 1952 SAC became interested in a readily convertible B-36 bomber-tanker. The Air Force asked Convair to equip one B-36 with a probe and drogue refueling system for tests. The modification contract was approved in February 1952 and the work was completed in May. Test was satisfactory, even though it had to be postponed until the end of the month because of the late availability of the B-47 receiver aircraft. No other tests took place until January 1953, after an improved British-made probe and drogue refueling system was installed. The converted B-36H tanker had a crew of nine and could be returned to its standard bomber configuration in 12 hours. But the B-36's bomber commitments never allowed SAC to exploit these features.

DB-36H/RASCAL

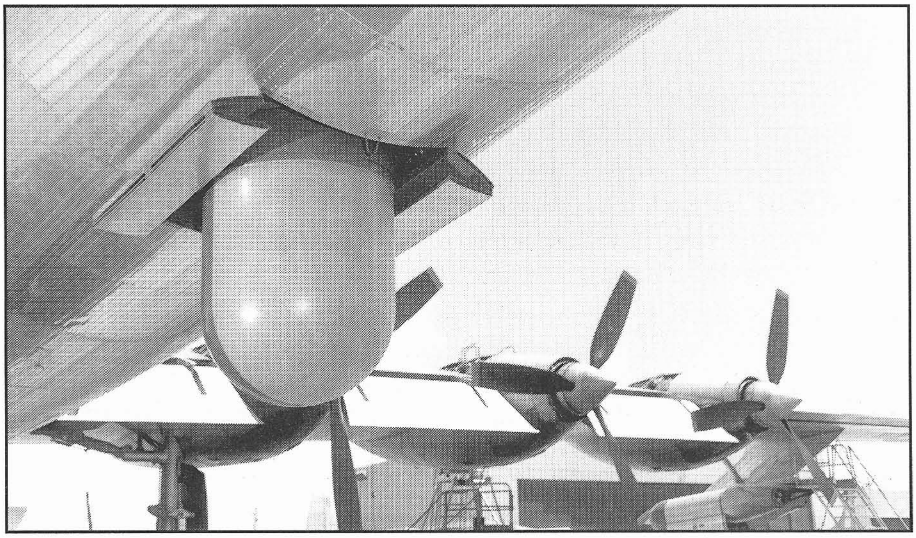
Three B-36Hs (50-1085, 51-5706, and 51-5710)[1] were modified to carry the Bell GAM-63 RASCAL rocket-powered air-to-surface guided missile. RASCAL was an acronym which stood for RAdar SCAnning Link, named for the guidance system that was used during the missile's dive on the target. The GAM-63 was powered by a Bell-designed 4,000-pounds-thrust liquid-fueled rocket engine with three vertical in-line thrust chambers. The missile had a launch weight of 13,000 pounds and was 31 feet long with a body diameter of four feet. The missile could carry a 3,000-pound nuclear warhead up to 100 miles at a speed of Mach 2.95. A retractable radio antenna was installed in the aft fuselage of the B-36 to provide an initial data link to the missile. The missile itself was carried semi-submerged in the combined bomb bay No. 3/4.







The RASCAL missile was large, even for the B-36. The two photographs above show the first test fit of the missile attached to the DB-36H. Note the folding lower fin on the missile, and the plywood "security" fences around the aircraft. The vertical photo shows the launch platform from inside the bomb bay. The photo at right is the retractable missile guidance radar under the rear fuselage. (Convair via LMTAS/Mike Moore)



Originally, 11 other B-36Hs were scheduled to be modified as Rascal carriers under the designation DB-36H. However, in 1955 the Air Force decided that the B-47 was a more suitable carrier, and the DB-36 modification contract was cancelled. The majority of the test program took place during 1955, and all three aircraft had been scrapped by November 1957. The RASCAL turned out to be a fairly accurate and effective missile, but the concept rapidly became obsolete in the face of new developments in the field of air-launched missiles. The RASCAL program itself was cancelled on 9 September 1958.

XP-85 Goblin

The first jet fighters introduced near the end of World War II had insufficient range to escort the long-range B-35 and B-36 bombers then on the drawing boards. As one possible solution to this problem, the Army Air Forces revived the parasite fighter idea of the early 1930s, and proposed that the long-range bombers carry their protective fighters right along with them. On 29 January 1944, the Army Air Forces invited the industry to submit concept proposals for parasite jet fighters.

The McDonnell Aircraft Corporation was the only company to respond,

The little XP-85 Goblin was a unique design, especially in the days before computerized flight controls made inherently unstable aircraft a reality. The aircraft demanded more from its pilot than could reasonably be expected. (Peter M. Bowers Collection)

One XP-85 survives at the Air Force Museum, where it is displayed in front of the B-36. (Terry Panopalis)

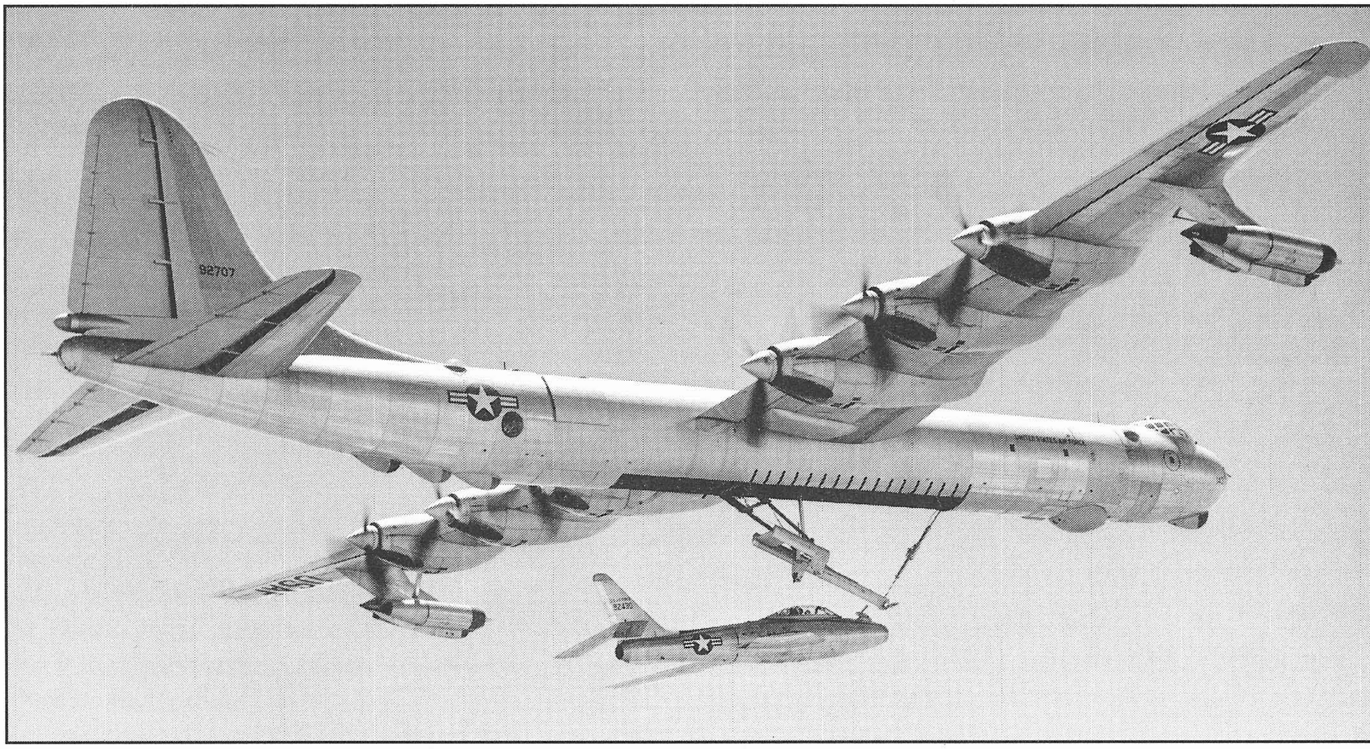
and proposed a small fighter aircraft to be carried partially inside a parent B-29, B-36, or B-35 heavy bomber. However, the AAF rejected this plan in January 1945, concluding that the fighter would have to be carried entirely inside the B-35 or B-36.

On 19 March 1945, McDonnell submitted a revised proposal for an even smaller aircraft with an egg-shaped fuselage, a triple vertical tail, a tailplane with pronounced anhedral, and vertically-folding swept-back wings. The engine was to be a 3,000-pounds-thrust Westinghouse J34-WE-7 axial-flow turbojet with a nose intake and a straight-through exhaust. The aircraft was to be fitted with a pressurized cockpit and an ejection seat. Armament was to be four 0.50-inch machine guns in the forward fuselage sides. It would be launched and recovered from a trapeze-like structure which would be extended from its parent aircraft.

The Army Air Forces liked the proposal, and ordered two XP-85 prototypes and a static test article on 9 October 1945. The Army Air Forces specified that the 24th (the first B-36B) and subsequent B-36s would be capable of carrying one P-85 in addition to the usual bomb load. It was even planned that some B-36s would be modified so that they could carry three P-85 fighters and no bomb load. It appears that the first few B-36Bs actually had the mounting brackets for the trapeze included in their bomb bays.

Since the XP-85 was to be launched and recovered from a retractable trapeze underneath its parent bomber, no conventional landing gear was installed. A retractable hook was installed on top of the fuselage in front of the cockpit. During recovery, the XP-85 would approach its carrier bomber from underneath, and the hook would gently engage the trapeze. Once securely attached, the aircraft would be pulled up into the bomb bay. If an emergency landing were necessary, the aircraft was provided with a retractable steel skid underneath the fuselage, and the wingtips were protected by steel runners.

Since a B-36 could not be spared for the project, a B-29B (44-84111) was modified with a special launch-and-recovery trapeze for use in the initial testing. A few test flights were made with the XP-85, but the recovery operation proved to be much more difficult than expected, forcing several emergency landings using the retractable steel skid. The Air Force reluctantly concluded the Goblin was simply too difficult to handle and would probably be far beyond the capabilities of the average squadron pilot. In addition, it was projected that the performance of the XP-85 would likely be inferior to that of foreign interceptors that would soon enter service. Furthermore, a budget crunch in the autumn of 1949 led to a severe shortage of funds for developmental projects. Consequently, the Air Force terminated the XP-85 program on 24 October 1949.

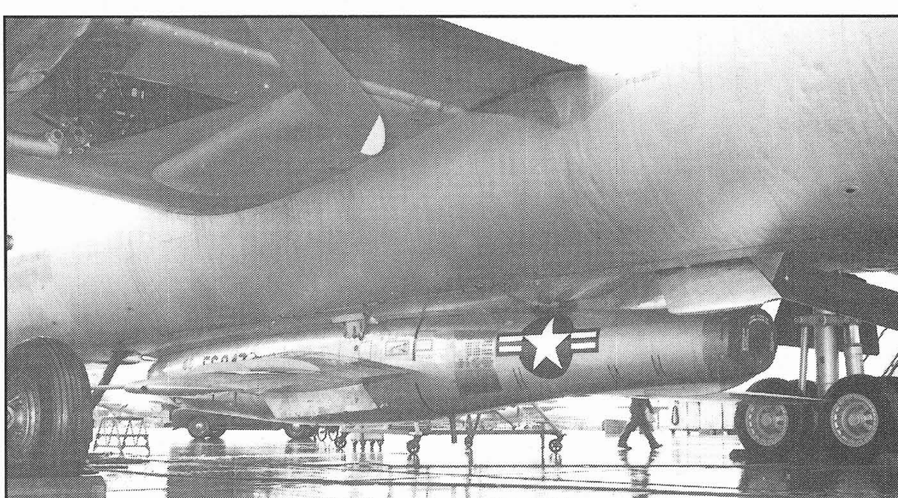


The second series of FICON tests used the prototype YF-84F sweptwing Thunderstreak. The trapeze was much simpler than the one designed for the abortive XP-85 tests and proved much more effective. Of course, the more conventional handling qualities of the F-84 compared to the Goblin undoubtedly helped also. (Convair via LMTAS/Mike Moore)

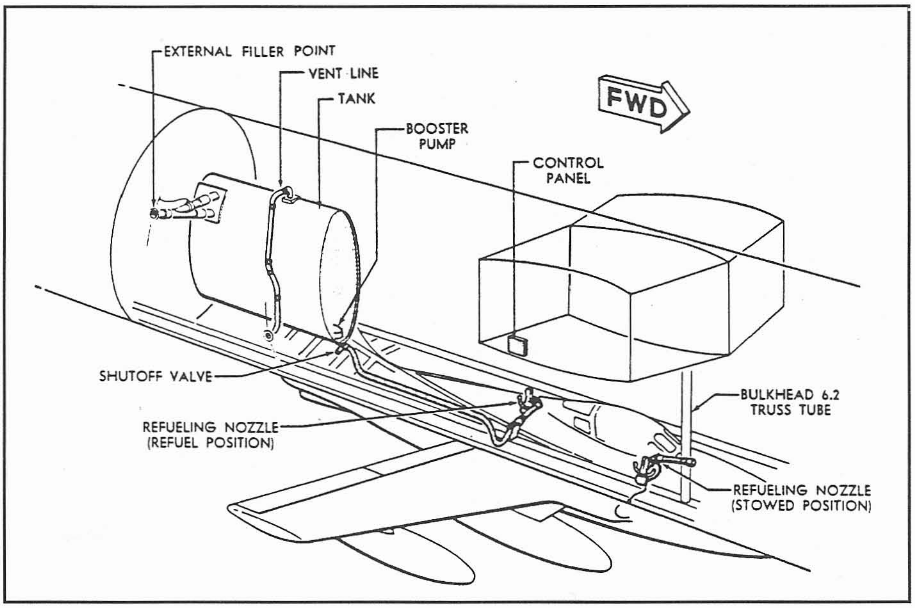
FICON

The FICON (FIghter CONveyor) project was essentially a follow-on to the earlier XP-85 experiments. It was reasoned that many of the difficulties encountered with the XP-85 were due to that aircraft's unique shape, largely dictated by the requirement that it fit entirely into the bomb bay of a B-35 or B-36. If that requirement was relaxed, a more conventional fighter configuration could be used. Since the straight-wing Republic F-84 Thunderjet was proving to be fairly successful in service, an F-84E was chosen as the subject of the next round of experiments.

On 19 January 1951, Convair was authorized to modify an RB-36F (49-2707) to carry a modified F-84E. The bomb bay of the GRB-36F was extensively modified, and the usual bomb racks were replaced by a retractable H-shaped cradle that was securely fastened to the rear wing spar. A single F-84E (49-2115) was modified to carry a hook on the upper nose ahead of its cockpit. During the recovery operation, the F-84E was to fly up underneath the



A production RF-84K under a GRB-36D. Note the downward-canted horizontal stabilizers on the fighter to clear the sides of the bomb bay. Although the combination could take-off while mated, the fighter had to be released before the bomber could retract its landing gear. (Convair via LMTAS/Mike Moore)



The RF-84K could be refueled from a special tank of JP-4 carried in bomb bay No. 4 – the B-36 did not normally carry jet fuel. (U.S. Air Force)

B-36 and use its hook to engage a slot in the cradle. The cradle would then rotate down over the fuselage of the F-84E and engage hard-points on the rear fuselage. Once attached, the F-84E would be pulled upward and nestle semi-submerged in the bomb bays of the GRB-36F. Launch was carried out by reversing this process.

The GRB-36F/F-84E combination began its first tests on 8 January 1952 and the first complete cycle of retrieval, retraction, and launch took place on 23 April 1952. The tests were remarkably trouble-free, and demonstrated that a good pilot should have no particular difficulty performing the operation.

By this time there was less emphasis on using the FICON concept for fighter escorts, but a new need had developed. Increasing Soviet air defenses were making it more difficult for the large strategic reconnaissance aircraft to penetrate Soviet airspace. The Air Force was not as worried about bomber penetration

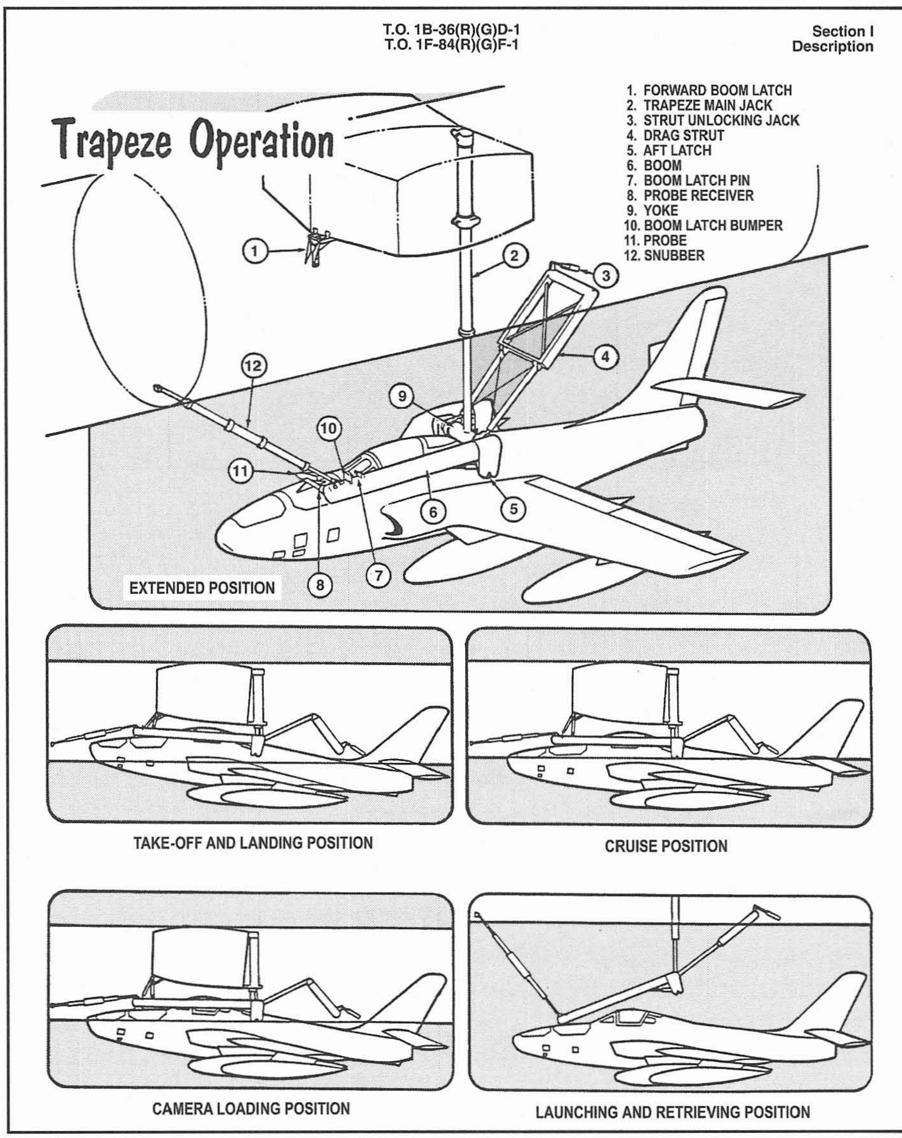
When the RF-84K was in the bomb bay, space was at a premium. Nevertheless, the pilot of the fighter could get out of the aircraft with some assistance. Note the handholds on the bottom of the wing carry-through structure. (Convair via LMTAS/Mike Moore)

since by that time the two nations would be at war and fleets of bombers could assist in protecting each other. But reconnaissance aircraft penetrated one at a time, hopefully without being detected. The FICON concept offered a way to transport a relatively small reconnaissance aircraft close to Soviet borders. It could then be released, make its reconnaissance run, and return to the waiting carrier aircraft. The new Republic RF-84F Thunderflash would be perfect. And it could carry a small atomic weapon if the need ever arose.

In 1953, the first swept-wing YF-84F (51-1828) was modified in much the same manner as the F-84E, except that its horizontal stabilizer (which had been relocated in the sweptwing version) was sharply canted downward in order to clear the bottom of the B-36 during launch and recovery. Contracts awarded Convair and Republic in the fall of 1953 called for modifying 10 RB-36D-IIIs and 25 RF-84Fs (52-7254/7278), respectively. This was far below the number of aircraft SAC originally had in mind – 30 RB-36s and 75 RF-84s – but another budget crunch had arrived. The first GRB-36D-III carrier was delivered in February 1955, six months ahead of the first GRF-84K.

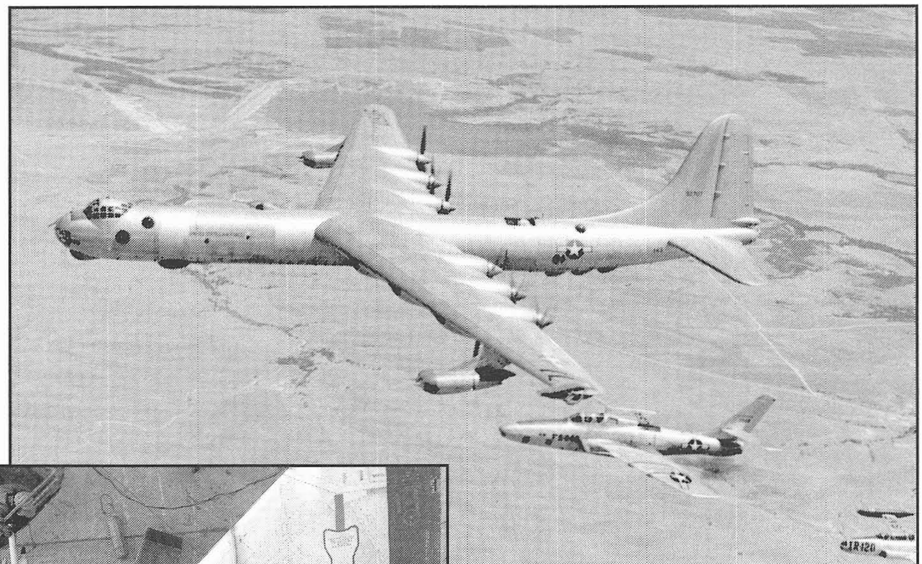
The parasite could be picked up in midair enroute to the target area, or by ground hook-up prior to takeoff. Night operations were also possible. In a typical mission, the GRF-84K was carried out to a 2,810-mile radius and launched at an altitude of 25,000 feet. After completing the mission, the fighter would be recovered by the GRB-36D and returned to base. The parasite plane would be released about 800-1,000 miles from the target and within a relatively safe area. The pilot of the RF-84 would continue on to the target, obtain high- or low-level photography, as desired, then return to the carrier.

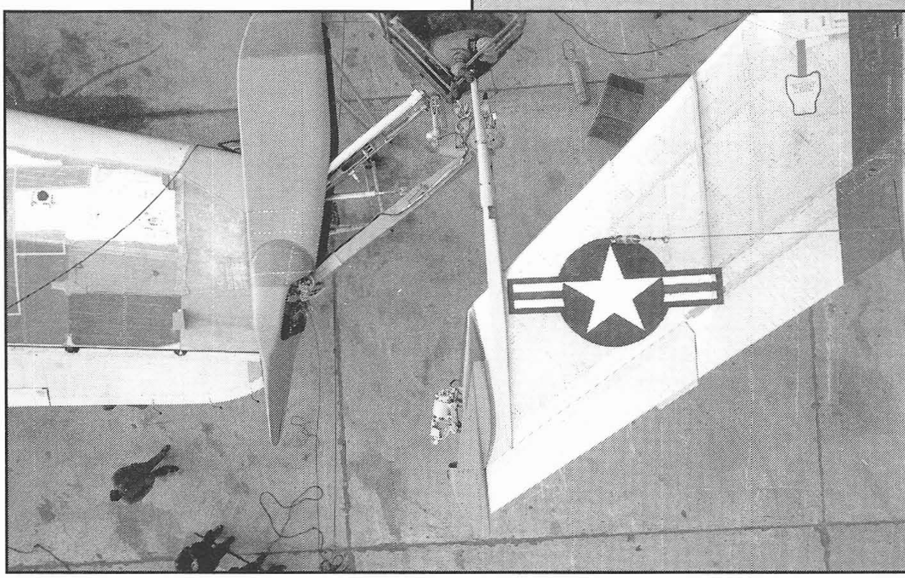
The GRB-36Ds were modified with plug-and-clearance doors instead of bomb bay doors, the FICON trapeze, a trapeze operator's station in the camera compartment, and two independent hydraulic systems for trapeze and door actuation. The clearance doors fit tight,y around the parasite during flight, while the plug doors filled the hole that remained when the GRF-84K was not being carried. Special night and rendezvous lighting was installed on the GRB-36D horizontal stabilizers and under the fuselage, and an APX-29A IFF/rendezvous set was installed. The bomb bay was equipped with a catwalk, safety wires, and handholds so that the GRF-84K pilot could ingress/egress during flight. Since the B-36 did not normally carry jet fuel (the jet engines were modified to run on aviation gas), an 1,140-gallon fuel tank filled with JP-4 was carried off-



Even the camera film magazine could be replenished while the GRF-84K was tucked in the GRB-36D's bomb bay. (U.S. Air Force)

Operation TOM TOM was a different approach to carrying fighters. Special mechanisms on the wingtips locked together and the fighters were towed along with their engines off. This method allowed the B-36 to carry two RF-84Fs, but did not allow the fighter pilots the chance to get out of their aircraft for the long trip, or for the bomber to refuel or rearm the fighters like FICON. (Peter M. Bowers Collection)





A topside view of the docking mechanism during a ground test where the F-84 and B-36 were mated using overhead derricks. In this photo the F-84 has just made initial contact with the B-36 docking arm. The docking arm will be retracted into the fairing, and the wingtip of the F-84 will be secured at the trailing edge using a locking mechanism, shown at right in a bottom view of the same test. (Convair via LMTAS/Mike Moore)

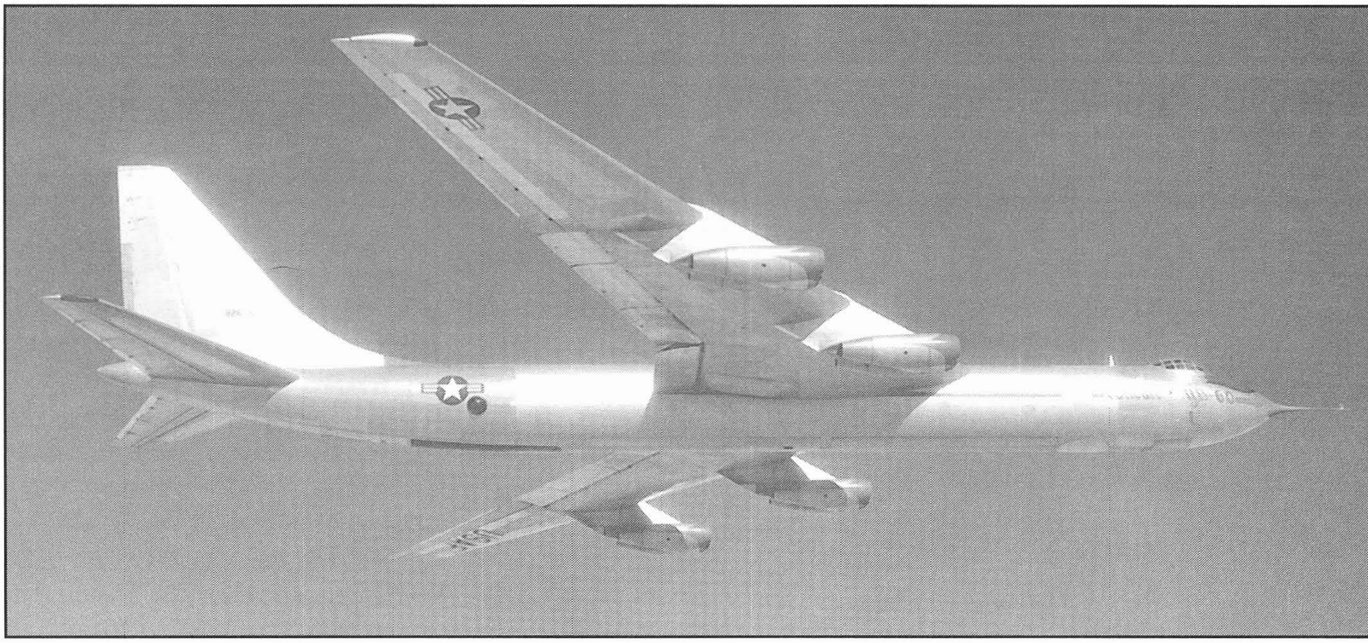
set to the left side (to clear the GRF-84K's tail) in bomb bay No. 4 so that the GRF-84K could be refueled while mated.[2] The GRB-36D could also supply electrical power, preheat air, and pressurization air to the parasite during flight.

The GRB-36D carriers saw limited service with the 99th Strategic Reconnaissance Wing based at Fairchild AFB, operating in a team with GRF-84Ks of the 91st Strategic Reconnaissance Squadron based at nearby Larson AFB. No details have been released concerning the missions flown by the FICONs, but stories have circulated that the RF-84Ks made several overflights of the Soviet Union on reconnaissance missions prior to the U-2 becoming available. Once the U-2 had proven its capability, the FICONs were quickly phased out of service.

TOM TOM

Several other bizarre experiments were performed during the late 1940s and early 1950s to test the feasibility of extending the range of jet fighters by having them carried into the combat zone by bombers. None of these range-extension experiments was more bizarre than Projects TIP TOW and TOM TOM where jet fighters were attached to the wingtips of B-29s and B-36s.

Two F-84Bs (46-641 and 44-661) were modified for the initial TIP TOW tests under the designation



The YB-60 was a sleek looking aircraft, but actually had a fairly bad drag coefficient owing to its B-36 origins. Its top speed was 100 mph slower than the B-52, although it had a longer range and a larger bomb capacity. After only 66 flight hours, the aircraft was grounded. The second aircraft never flew. (Tony Landis Collection)

EF-84B. The wingtips of the EF-84Bs were modified so that they could be attached to flexible mounts fitted to the wingtips of a specially modified EB-29A (44-62093).

This idea proved to be highly dangerous, although several successful linkups were made. Tragically, midway through the planned test series, the entire three-plane B-29 array crashed as a unit on 24 April 1953, killing everybody on all three aircraft. TIP TOW was cancelled.

A parallel project was undertaken with a pair of RF-84Fs (51-1848 and 51-1849) attached to wingtip hookup assemblies on the initial GRB-36F testbed (49-2707). After the TIP TOW crash, flight tests continued for a few months with this RF-84F/GRB-36F/RF-84F array. Only a few hookup attempts were made, and wingtip vortices and turbulence made this operation a very dangerous affair. One RF-84F was actually torn free from the bomber's wing during a linkup. The project was abandoned in late 1953, since experiments with mid-air refueling techniques seemed to offer greater promise for increased fighter ranges with far less risk to the lives of aircrews.

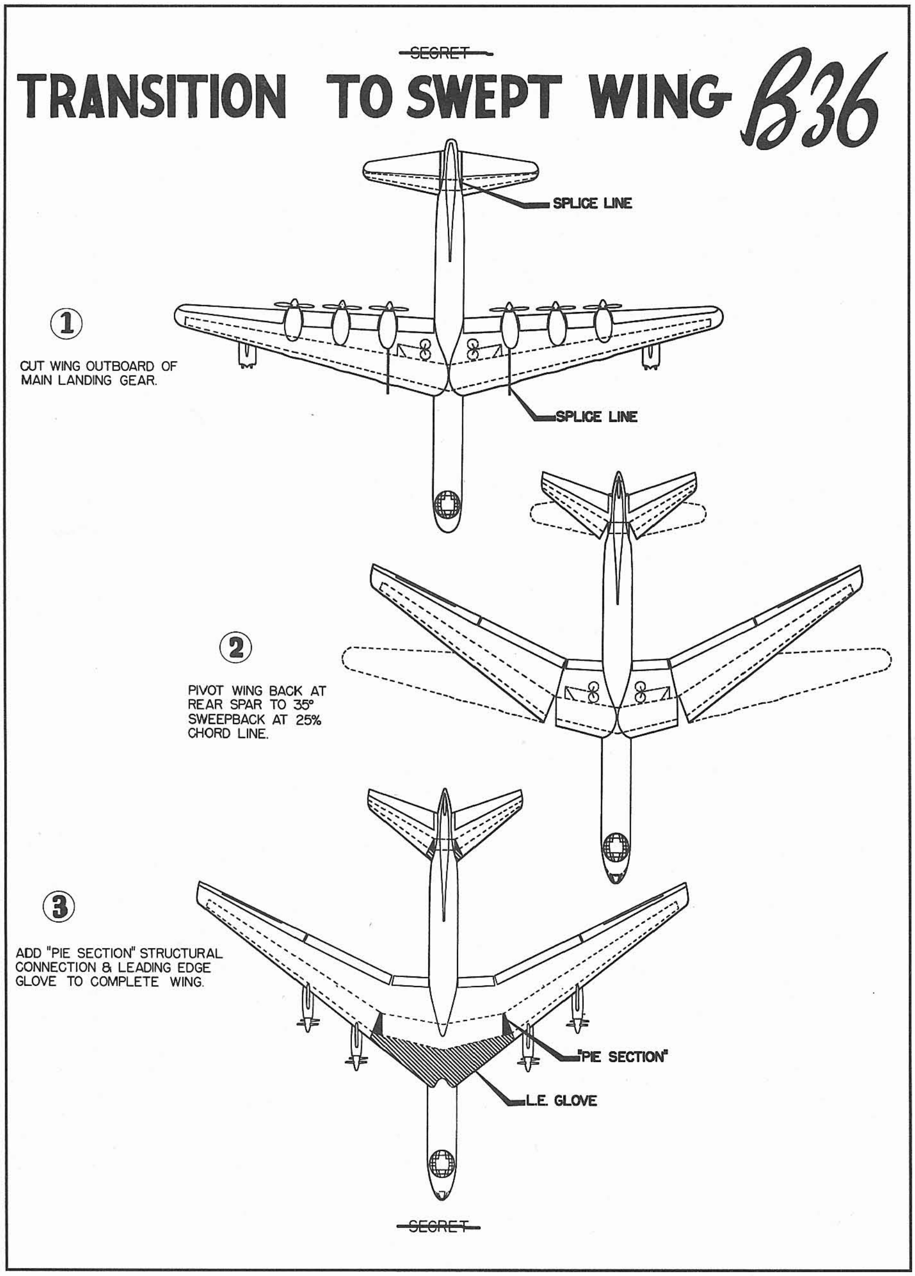
YB-60

It was clear early-on that the B-36 replacement was going to be the Boeing B-52, although at the beginning it was not nearly as clear if the B-52 was going to be a turboprop or a pure-jet aircraft. By January 1951 the first two B-52s were being assembled and the general configuration of the eight-engine jet bomber was well known. Although the Air Force never conducted an actual competition for possible B-52 alternatives, both Convair and Douglas worked on various designs that could fill the role.

The Douglas design that was most promising was the 1211-J turboprop revealed in January 1951. The design was for a swept-wing aircraft with a design gross weight of 322,000 pounds, a speed of 450 knots at 55,000 feet, and an absolute range of 11,000 miles. The design looked similar to the Soviet Tu-4 Bear bomber.[3]

Convair also wrestled with the question of pure-jet versus turboprop propulsion. At one point the Convair options included a six-turboprop design that had each engine housed in its own pod slung beneath the wings, and a pure-jet version that used 12 J47 engines in six pods beneath the wings.[4]

On 25 August 1950, Convair submitted an unsolicited proposal for an all-jet swept-winged version of the B-36. The Air Force was sufficiently interested that on 15 March 1951 they authorized (contract No. AF-33(038)-2182) Convair to convert two uncompleted B-36Fs (49-2676 and 49-2684) into B-36Gs.



How to convert a B-36 to a swept wing in three easy steps. The majority of the structural pieces (spars, etc.) were shared between the B-36 and YB-60. (Convair via the San Diego Aerospace Museum)

Since the aircraft was so radically different from the existing B-36, the designation was soon changed to YB-60. By the 20 August 1951 mockup review, it was noted that the turbojet engines were scheduled to be replaced by turboprop engines in June 1953. Production of either aircraft configuration, could begin in March 1953 if authorization was received by 1 January 1952.[5]

In the interest of economy, as many components as possible of the existing B-36F were used to build the YB-60. The fuselage from aft of the cabin to near the end of the tail remained essentially the same as that of the B-36F. However, the nose was lengthened to accommodate more equipment, and was tapered to a needle-like instrument probe. The aft fuselage was modified to house a braking parachute and a retractable tail wheel to protect the tail section against nose-high landings. At 171 feet, the fuselage was almost nine feet longer than that of the B-36F.

A wing sweep of 37° was accomplished by cutting each main wing spar outboard of the main landing gear, and inserting a wedge-shaped structure at each location to angle the main spar 35°. A glove was added to the leading edge of the center wing to continue the sweep line to the fuselage. The net result was a wing area to 5,239 square feet, an increase of almost 500 square feet. The wing span was 206 feet, about 24 feet less than that of the B-36F. An entirely new leading and trailing edge was fabricated, including new flaps and ailerons. The aircraft was also fitted with swept vertical and horizontal stabilizers, making the aircraft slightly taller than the B-36F. Most of the structure inside the new horizontal and vertical surfaces were common with the B-36, simply angled appropriately, covered with new skin, and fitted with new control surfaces. Eight 8,700 pounds-thrust Pratt & Whitney J57-P-3 turbojets were housed in four pairs suspended below and forward of the wing leading edge, similar to the B-52.

The first YB-60 had only five crew members – pilot, copilot, navigator, bombardier/radio operator, and radio operator/tail gunner – all seated in the pressurized forward compartment. All of the defensive armament was eliminated except the tail turret, which was remotely directed by an APG-32 radar. The

K-3A bombing/navigation system, with its associated Y-3A bomb sight, was retained. The maximum bomb load capacity of 86,000 pounds was the same as the B-36F.

The second prototype and production aircraft would have carried a crew of nine. The pilot, copilot-engineer, bombardier, navigator-gunner, engineer-gunner were in the forward compartment, and a radio-ECM operation, tail gunner, and two gunners were in a pressurized aft compartment. The copilot's seat tracks were arranged such that he could move his entire seat to the engineer's panel if necessary during flight. The two lower aft sighting stations were positioned higher on the fuselage to improve crew comfort during use. Interestingly, the tunnel that B-36 crewmembers could use to move between the two compartments was deleted because "... the arrangement of equipment and functions of crew members make it unnecessary." Galleys, bunks, and lavatory facilities were installed in each compartment. Production aircraft were to include two upper forward turrets and two lower aft turrets, with standard B-36 optical sights in their normal locations. The tail gun-laying radar would switch to the APG-41 scheduled for use on the B-36H, and a modified APG-41 would be incorporated in the nose to control the two upper forward turrets, in addition to "... furnishing information to the pilot for evasive maneuver tactics." The normal APR-4, APR-9, and ALA-2 ECM equipment would have been replaced with an APR-14, and an APT-16 added. Convair also proposed using a new type of turret that retracted flush with the upper surface of the aircraft, eliminating the doors found on the B-36. This would simplify maintenance, and decrease the time necessary to deploy the turrets when necessary.[6]

Although the first prototype had the K-3A's APS-23 search radar located in a radome behind the nose gear like the B-36, production units would have been behind a flush radome in the nose. The packaging arrangement for the entire K-3A system was unique however. All the components, including the antenna and radome, were installed on a pallet that could easily be removed from the aircraft for maintenance. This arrangement also eliminated a variety of connectors and interconnecting cables which, it was hoped, would eliminate several areas that had proven troublesome in the B-36 installation. The entire K-3A pallet would be pressurized, and accessible by the crew during flight for maintenance. The designers were not terribly confident that this arrangement would improve the reliability of the K-3A, and they built in a complete set of test equipment and oscilloscopes on the pallet. Ten fuel tanks in the wings held 42,106 gallons of fuel. A little behind the times, Convair included a probe-and-drogue refueling system in the production specification.[7]

The conversion of the first aircraft (49-2676) began in the spring of 1951 in the Hanger Building at Fort

Even the YB-60 wing had the small bumps on the upper surface to provide clearance for the main landing gear. Like the B-36, all fuel was carried in the wing, leaving the entire fuselage for the crew and armament. (Convair via the San Diego Aerospace Museum)

Worth (not in the main production building). The work was completed in only eight months, since almost 72% of the parts were identical to the B-36F. However, the project was delayed by the late delivery of the J57 turbojets, which did not arrive at Convair until April 1952. The aircraft was rolled out on 6 April 1952, and was the largest jet aircraft in the world at the time.

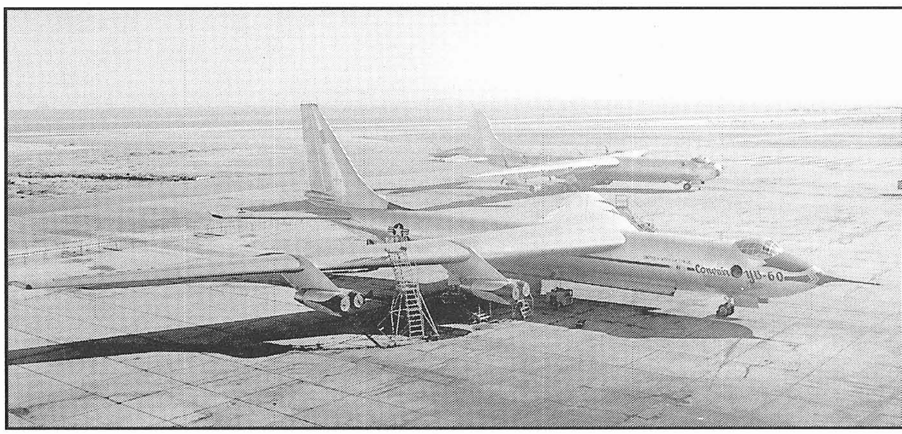
The YB-60 made its maiden flight on 18 April 1952, with Convair chief test pilot Beryl A. Erikson at the controls. The Boeing YB-52 took to the air for the first time only three days later. Although there was never any formal competition between the YB-60 and the YB-52, the B-52 quickly exhibited a clear superiority. The YB-60 had a cost advantage over the B-52 because of its commonality with the B-36, but the B-52 clearly had a superior performance. The top speed of the YB-60 was only 508 mph at 39,250 feet, more than 100 mph slower than the B-52. In addition, flight tests of the YB-60 turned up a number of deficiencies, including engine surge, control system buffeting, rudder flutter, and electrical system problems. The stability was rather poor because of the high aerodynamic forces on the control surfaces acting in concert with fairly low aileron effectiveness. The refined aerodynamics of the B-52, which had been designed from the beginning as a high-speed aircraft, quickly proved their worth.

The YB-60s were built in the Hanger Building, not on the main assembly line. The engines were the pacing item in the YB-60s development, and the late delivery of the J57s delayed the aircraft's first flight. (Convair via the San Diego Aerospace Museum)

Consequently, the Air Force concluded that there was no future for the YB-60, and cancelled the flight test program on 20 January 1953 after accumulating only 66 flight hours. The second prototype was never flown, although it was 95% complete, basically only missing its engines.

Although the Air Force formally accepted both YB-60s in mid-1954, flight testing had already been terminated, and the two aircraft had been permanently grounded. The two YB-60s were shunted off to the side of the runway at Fort Worth, where they sat out in the weather for several months. The Air Force decided that it was costing too much to maintain the aircraft, and on 1 July 1954 workmen took axes and blow torches to the aircraft. By the end of July 1954, they had both been scrapped, with some of the components that were common with the B-36F being scavenged for spare parts. The cost of the YB-60 program was approximately $15 million.[8]

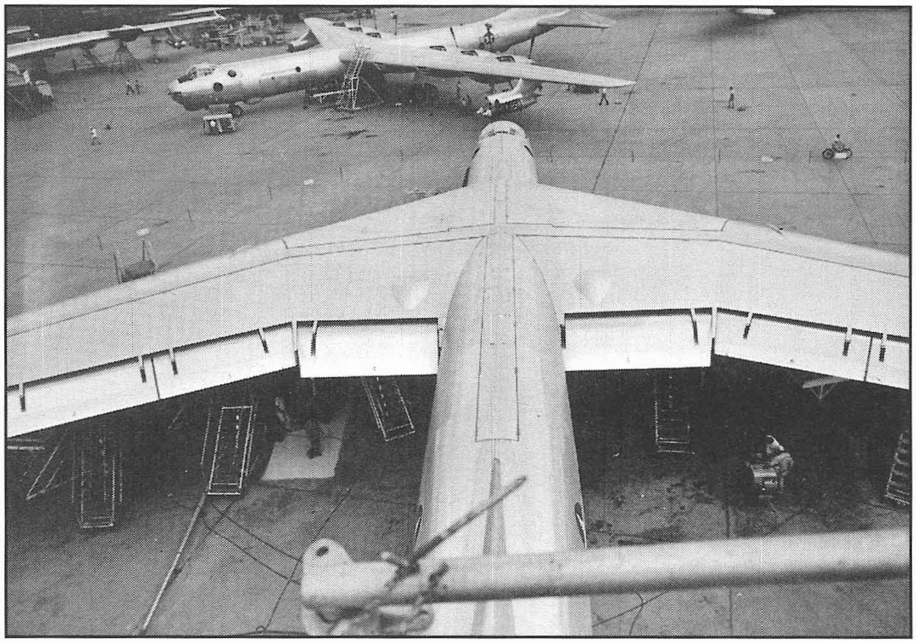
Convair also considered trying to adapt the YB-60 as a commercial jet airliner, again to no avail. A proposal for a 380,000 pound gross weight commercial version was powered



The YB-60 flew some of its test flights out of Edwards AFB, and is seen here with a B-36. Production B-60s would not have had the pointed nose probe seen on the prototype, and would have included defensive armament. (Tony Landis Collection)

by eight P&W J57-P-1 engines, and carried 261 passengers, a flight crew of five, and a cabin crew of four. It was expected the aircraft would cost $7 million, plus an additional $1 million for engines. The aircraft would have had a maximum range of 3,450 miles, and would have been available in December 1956. Interestingly, although the aircraft could fly nonstop from New York to London with 261 passengers, it could only carry 22 passengers on the return flight because of the prevailing 100 mph east wind encountered at cruising altitude.[9]

As part of this proposal, Convair surveyed a variety of commercial airports to determine if they could handle aircraft of this size. None of the three major airports (Los Angles, Chicago Midway, or New York Idlewild) could accommodate an aircraft with the proposed wingspan or gross weight. Convair estimated that operating costs could be covered with an average of 215 passengers per flight. But engineers also noted that the YB-60 derivative only had a projected speed of 432 mph, compared with 550 mph for the Boeing 707 and other competitors. In the end, Convair decided to concentrate on the 880-series of jet transports instead.



Although much of the wing structure was common with the B-36, the entire trailing edge including the flaps and ailerons, was unique to the YB-60. (Convair via the San Diego Aerospace Museum)

Atomic Aircraft

Interest in atomic energy hit full force following World War II. The scientists who had raced to produce a bomb had also developed a number of other possible uses for the atom. Ideas ranged from power generation to nuclear excavation to nuclear propulsion for vehicles on land, sea, and in the air. There were proposals for atomic-powered ships, submarines, locomotives, automobiles, and aircraft.

In May 1946 the Air Force initiated the Nuclear Energy for the Propulsion of Aircraft (NEPA) project to support developing long-range strategic bombers and other high-performance aircraft. Nuclear power showed promise in both fields because of its dual nature of almost unlimited fuel and the high temperatures theoretically possible using a reactor. The NEPA contract was awarded to the Fairchild Engine & Airframe Co., and the work was conducted at Oak Ridge. By the end of 1948 the Air Force had invested approximately $10 million in the program, and studies continued until 1951.

The NEPA project was replaced by the Aircraft Nuclear Propulsion (ANP) program, a joint effort between the Atomic Energy Commission (AEC) and the Air Force to develop a full-scale aircraft reactor and engine system. One of the factors that led to the ANP program was a 1948 MIT study that concluded that "... nuclear aircraft (manned) were likely less difficult than nuclear ramjets, which, in turn, would be less difficult than nuclear rockets to develop." Ironically, this turned out to be the opposite of what would later be found. Although nuclear ramjets, under Project Pluto, and nuclear rockets, under Project Rover, were successfully tested at the levels needed for operational use, an operational-level atomic aircraft powerplant was never developed.

NB-36H

The ANP program did spawn plans for two flight vehicles. The first was an effort to more fully understand the shielding requirements for an airborne reactor. A decision was made to build a small reactor and flight test it aboard a B-36. The reactor would not provide any power to the aircraft, but would be operated in flight and both the reactor and its associated radiation levels would be

The NB-36H can lay claim to be the only U.S. aircraft to carry an operating nuclear reactor airborne. The reactor did not provide any power to the aircraft, but allowed engineers to gather "real world" data on the operation of reactors and their shielding aboard aircraft. (Convair via LMTAS/Mike Moore)

carefully monitored during a series of flight tests. This aircraft was referred to as the Nuclear Test Aircraft (NTA), and its development was carried out under contract AF33(038)-21117, while construction of the Nuclear Aircraft Research Facility at Fort Worth to support the program was accomplished under contract AF33(600)-6216.[10]

Convair spent a surprising amount of time defining the crew compartment for the NB-36H and its five crewmembers. The preliminary design for an appropriate crew compartment exceeded the structural limitations of the B-36H forward fuselage by a rather large margin and was rejected. A decision on 4 June 1952 to delete some crew comfort items and to move some equipment to other locations on the aircraft, resulted in weight estimates within the structural limitations of the aircraft. After evaluating seven alternatives, the final design had a pilot and copilot at stations essentially similar to the standard B-36, although lower in the fuselage. Two nuclear engineers were located immediately aft of the pilots, facing forward. The flight engineer was located in the extreme necked-down aft end of the compartment on the centerline of the airplane, also facing forward.

Construction of a crew compartment mockup began in July 1952. The new nose section would replace the conventional nose section on the B-36H forward of station 5. The basic fuselage lines of the aircraft would remain substantially the same, except the new crew compartment was slightly shorter. Also, the nose landing gear would be moved six inches forward to accommodate the entry hatch to the crew compartment.

Although the B-36 was a large aircraft, and the normal crew compartment provided a great deal of room for the crew, the NB-36H would not have this luxury. The amount of shielding required to protect the crew greatly decreased the space available. The station arrangements were carefully planned to obtain the maximum efficiency from the crew and their equipment within the confined area of the compartment. For example, one problem concerned the placement of the nuclear engineer's oxygen regulators and interphone panels. It was finally decided that the instruments could be mounted on a drop-door hinged to the base of each nuclear engineer's seat. When let down, the door fell

between the engineer's legs just above his feet, allowing him to see the instruments. When not in use, the door was pushed upright against the seat, out of the way.

At the pilot's stations, there was only a single set of instruments, located in the middle of the panel since there was not sufficient room behind the panel for all the normal plumbing and electrical wiring. The engine scanning normally performed by crewmembers in the aft compartment was performed instead by using television cameras. A location for the television itself could not be found, however, until it was decided to locate it in the overhead area between the two nuclear engineers, where it could be seen relatively easily by the flight engineer.

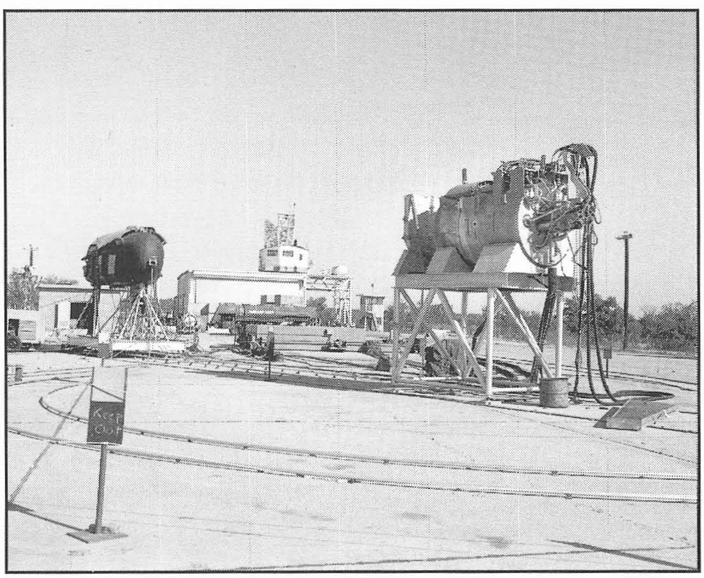
Although the two pilots had movable seats, the other three seats were fixed since there was insufficient room. The area underneath the seats was used for storage.

A drinking water container was provided in the aft portion of the copilot's seat, while the aft side of the pilot's seat contained a relief tube. This location was chosen since it allowed crewmembers to stand at the only location in the compartment that was full-height. A conventional toilet was located outside the crew compartment in the fuselage near the entrance hatch.

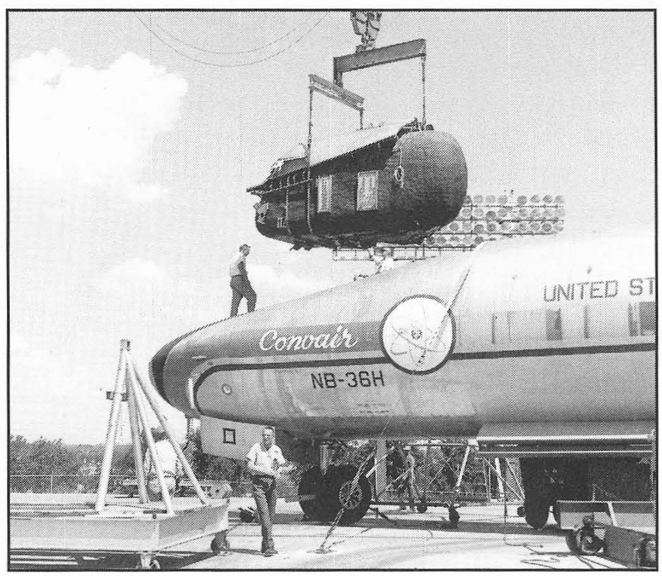
The yellow glass used in the windshield to provide shielding for the crew made the conventional gray color normally used in cockpits turn a very undesirable color. After much experimenting, designers found that using a lavender paint in the pilots' area gave the illusion of being gray when illuminated by daylight through the yellow windshield. The pilots' instrument panel was painted black, but all other panels were painted a very pale gray that made the compartment appear roomier. The seats were upholstered in light gray cloth, and the floors were covered in darker gray carpet. A curtain was installed between the pilots and the nuclear engineers to block sunlight.[11]

All portions of the exterior seen from the pilots' compartment were painted flat black to minimize glare. The initial design of a simple antiglare shield produced an unattractive pattern when combined with the black radome. The two areas were subsequently blended together and a small amount of trim extended upward and aft to provide a more appealing look.

Since the crew compartment was designed to be removable during maintenance, a method had to be devised to easily connect and disconnect the flight controls. Instead of the normal cables, a series of push-pull rods projecting from the bottom of the crew compartment was devised that could easily be connected to the cables in the lower fuselage. Push-pull rods were also used for both the pilots' and flight engineer's throttle and mix-



The NB-36H crew compartment and reactor vessel on stands in the nuclear area at Fort Worth. Both were radioactive and sent to Mountain Ridge for permanent storage. (Convair via LMTAS/Mike Moore)



The shielded crew compartment being removed from the NB-36H after the completion of the flight test program. The compartment was designed to be removed intact. (Convair via LMTAS/Mike Moore)

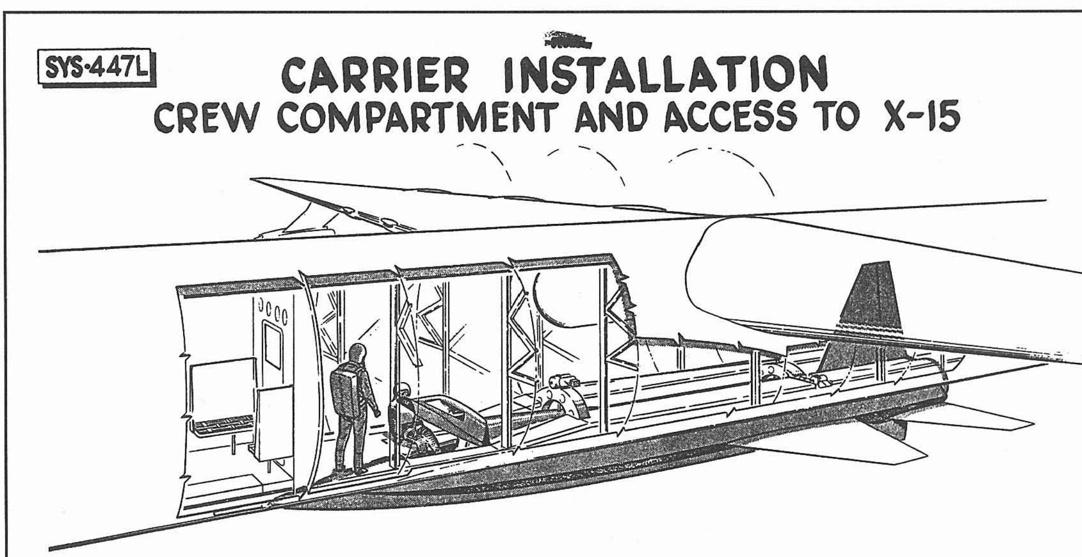
ture controls. These rods connected to the normal cable underneath the crew compartment.

The NTA began its life as a B-36H (51-5712) that had been extensively damaged during a tornado at Carswell AFB on 1 September 1952. The entire nose of the bomber had been destroyed, and since a new shielded crew compartment was part of the plan for the NTA, this airframe was a logical choice. The aircraft was redesignated XB-36H on 11 March 1955, and was again redesignated as NB-36H on 6 June 1955. The name *Convair Crusader* was painted on each side of the forward fuselage during a portion of the flight test series.

The NB-36H was modified to carry a small air-cooled reactor in the aft bomb bay and to provide shielding for the crew. The NTA incorporated shielding around the reactor itself and a totally new nose section which housed a twelve-ton lead and rubber shielded compartment for the crew. There were also water jackets in the fuselage and behind the crew compartment to absorb radiation. The crew was housed entirely in a modified compartment in the fuselage nose section. The compartment was composed of lead and rubber, and entirely surrounded the crew. A four-ton lead disc shield was installed in the middle of the aircraft. Only the pilot and copilot could see out through the foot-thick, leaded-glass windshield. A closed-circuit television system enabled the crew to watch the reactor.

A 1,000-kilowatt reactor that weighed 35,000 pounds was installed in a container that could be carried in bomb bay No. 4. The reactor could be removed from the aircraft while on the ground. The reactor was made critical in flight on several occasions and the aircraft was used for many radiation and shielding experiments. Its first flight was made on 17 September 1955, with test pilot A.S. Witchell, Jr. at the controls. Flying alongside the NB-36H on every flight was a C-97 carrying a platoon of armed Marines ready to parachute down and surround the test aircraft in case it crashed. A total of 47 flights were made through March 1957. The NB-36H was decommissioned at Fort Worth in late 1957 and scrapped several months later, with the radioactive parts being buried.

The flight program showed that the "aircraft normally would pose no threat, even if flying low." The principal concerns were accidents which cause the release of fission products from the reactors, and the dosage from exposure to leaked radioactivity (in the direct cycle concept).



The X-15 research airplane program first began, it was expected that a B-36 would be used as a carrier aircraft. The X-15 would be carried suspended in the B-36 bomb bays, much the same as earlier X-Planes had been carried by B-29s. The pilot could ingress/egress the X-15 during flight, something not possible with the final B-52 solution, although the B-52 offered much higher performance. Note the early tall tail on the X-15. (Johnny Armstrong Collection via Frederick A. Johnsen)

[1] Aircraft History Cards supplied by Mike Moore, Lockheed Martin, Fort Worth. [2] 1B-36(R)D(G)-1 FICON Flight Manual, 17 June 1955. [3] Aviation Week, 29 January 1951, p 13. [4] *Ibid.* [5] *Mockup Inspection of the Model YB-60 Airplane*, Convair, Contract No. AF-33(038)-2182, 20 August 1951, p 3. [6] *Ibid*, p 11. This represented the inclusion of MCRs 5009-5012, 5014-5016, and 5020-5022. [7] *Ibid*, p 22. [8] Fort Worth Star, various dates in July 1954. [9] Convair report FZP-36-1001, *YB-60 Commercial Transport*, 4 April 1953. [10] Convair report XM-566, *Short History of the Design and Development of the Nose Section and Crew Compartment Mock-Up for the XB-36H*, 20 March 1956. [11] *Ibid.*

THE NUMBERS

B-36, YB-60, AND XC-99 SERIAL NUMBERS

Designation	Serial Number(s)	Quantity	Contract Number	Notes
XB-36-CF	42-13570	1	W535-ac-22352	
YB-36-CF	42-13571	1	W535-ac-22352	To RB-36E
XC-99-1-CO	43-52436	1	W535-ac-34454	On display at the former Kelly AFB
B-36A-1-CF	44-92004/92006	3	AF33-038-AC7	To RB-36E (except 44-92004, Static Test Article)
B-36A-5-CF	44-92007/92011	5	AF33-038-AC7	To RB-36E
B-36A-10-CF	44-92012/92017	6	AF33-038-AC7	To RB-36E
B-36A-15-CF	44-92018/92025	8	AF33-038-AC7	To RB-36E
B-36B-1-CF	44-92026/92037	12	AF33-038-AC7	To B-36D
B-36B-5-CF	44-92038/92049	12	AF33-038-AC7	To B-36D
B-36B-10-CF	44-92050/92064	15	AF33-038-AC7	To B-36D (92057 was jet prototype)
B-36B-15-CF	44-92065/92079	15	AF33-038-AC7	To B-36D except 92075 and 92079 (crashed)
B-36B-20-CF	44-92080/92087	8	AF33-038-AC7	To B-36D
B-36D-1-CF	44-92095/92098	4	AF33-038-AC7	Ordered as B-36B
B-36D-5-CF	49-2647/2654	8	AF33-039-2182	
B-36D-35-CF	49-2655	1	AF33-039-2182	Last B-36D delivered
B-36D-15-CF	49-2656/2657	2	AF33-039-2182	
B-36D-25-CF	49-2658/2663	6	AF33-039-2182	
B-36D-35-CF	49-2664/2668	5	AF33-039-2182	
RB-36D-1-CF	44-92088/92094	7	AF33-038-AC7	Ordered as B-36B
RB-36D-5-CF	49-2686	1	AF33-039-2182	
RB-36D-10-CF	49-2687/2693	7	AF33-039-2182	
RB-36D-15-CF	49-2694/2697	4	AF33-039-2182	
RB-36D-20-CF	49-2698/2702	5	AF33-039-2182	
B-36F-1-CF	49-2669/2675	7	AF33-039-2182	
B-36F-1-CF	49-2677	1	AF33-039-2182	
B-36F-5-CF	49-2678/2683	6	AF33-039-2182	
B-36F-5-CF	49-2685	1	AF33-039-2182	
B-36F-10-CF	50-1064/1073	10	AF33-039-2182	
B-36F-15-CF	50-1074/1082	9	AF33-039-2182	
RB-36F-1-CF	49-2703/2711	9	AF33-039-2182	
RB-36F-5-CF	49-2712/2721	10	AF33-039-2182	
RB-36F-10-CF	50-1098/1099	2	AF33-039-2182	
RB-36F-15-CF	50-1100/1102	3	AF33-039-2182	
B-36G/YB-60-1-CF	49-2676	1	AF33-039-2182	Ordered as B-36F-1-CF
B-36G/YB-60-5-CF	49-2684	1	AF33-039-2182	Ordered as B-36F-5-CF
B-36H-1-CF	50-1083/1091	9	AF33-039-2182	
B-36H-5-CF	50-1092/1097	6	AF33-039-2182	
B-36H-10-CF	51-5699/5705	7	AF33-039-2182	
B-36H-15-CF	51-5706/5711	6	AF33-039-2182	
B-36H-20-CF	51-5712/5717	6	AF33-039-2182	
B-36H-25-CF	51-5718/5723	6	AF33-039-2182	
B-36H-30-CF	51-5724/5729	6	AF33-039-2182	
B-36H-35-CF	51-5730/5735	6	AF33-039-2182	
B-36H-40-CF	51-5736/5742	7	AF33-039-2182	
B-36H-45-CF	52-1343/1347	5	AF33-038-5793	
B-36H-50-CF	52-1348/1353	6	AF33-038-5793	
B-36H-55-CF	52-1354/1359	6	AF33-038-5793	
B-36H-60-CF	52-1360/1366	7	AF33-038-5793	
RB-36H-1-CF	50-1103/1105	3	AF33-039-2182	
RB-36H-5-CF	50-1106/1110	5	AF33-039-2182	
RB-36H-10-CF	51-5743/5747	5	AF33-039-2182	
RB-36H-15-CF	51-5748/5753	6	AF33-039-2182	
RB-36H-20-CF	51-5754/5756	3	AF33-039-2182	
RB-36H-20-CF	51-13717/13719	3	AF33-039-2182	
RB-36H-25-CF	51-13720/13725	6	AF33-039-2182	
RB-36H-30-CF	51-13726/13731	6	AF33-039-2182	51-13730 on display at Castle AFB
RB-36H-35-CF	51-13732/13737	6	AF33-039-2182	
RB-36H-40-CF	51-13738/13741	4	AF33-039-2182	
RB-36H-45-CF	52-1367/1373	7	AF33-038-5793	
RB-36H-50-CF	52-1374/1380	7	AF33-038-5793	
RB-36H-55-CF	52-1381/1386	6	AF33-038-5793	
RB-36H-60-CF	52-1387/1392	6	AF33-038-5793	
B-36J-1-CF	52-2210/2221	12	AF33-038-5793	52-2217 on display at SAC Museum; 52-2220 on display at U.S. Air Force Museum
B-36J-5-CF	52-2222/2818	12	AF33-038-5793	
B-36J-10-CF	52-2819/2827	9	AF33-038-5793	52-2827 undergoing restoration at Fort Worth
Total Production		**386**		

Significant Modifications:

YB-36A – Structural Test Article

B-36A 44-92004

GRB-36D-III – FICON Carrier Aircraft

RB-36D-1-CF 44-92090
RB-36D-1-CF 44-92092
RB-36D-1-CF 44-92094
RB-36D-10-CF 49-2687
RB-36D-10-CF 49-2692
RB-36D-15-CF 49-2694
RB-36D-15-CF 49-2695
RB-36D-15-CF 49-2696
RB-36D-20-CF 49-2701
RB-36D-20-CF 49-2702

GRB-36F – FICON and TOM TOM Test Aircraft

RB-36F-1-CF 49-2707

NB-36H – Nuclear Reactor Testbed

B-36H-20-CF 51-5712
Originally B-36H. XB-36H on 11 March 1955. NB-36H on 6 June 1955.

DB-36H – RASCAL Missile Launch Aircraft

B-36H-1-CF 50-1085
Originally B-36H. DB-36H in July 1955.

B-36H-15-CF 51-5706
Originally B-36H. DB-36H in January 1955. JDB-36H in February 1955. EDB-36H in August 1955. JDB-36H in November 1955.

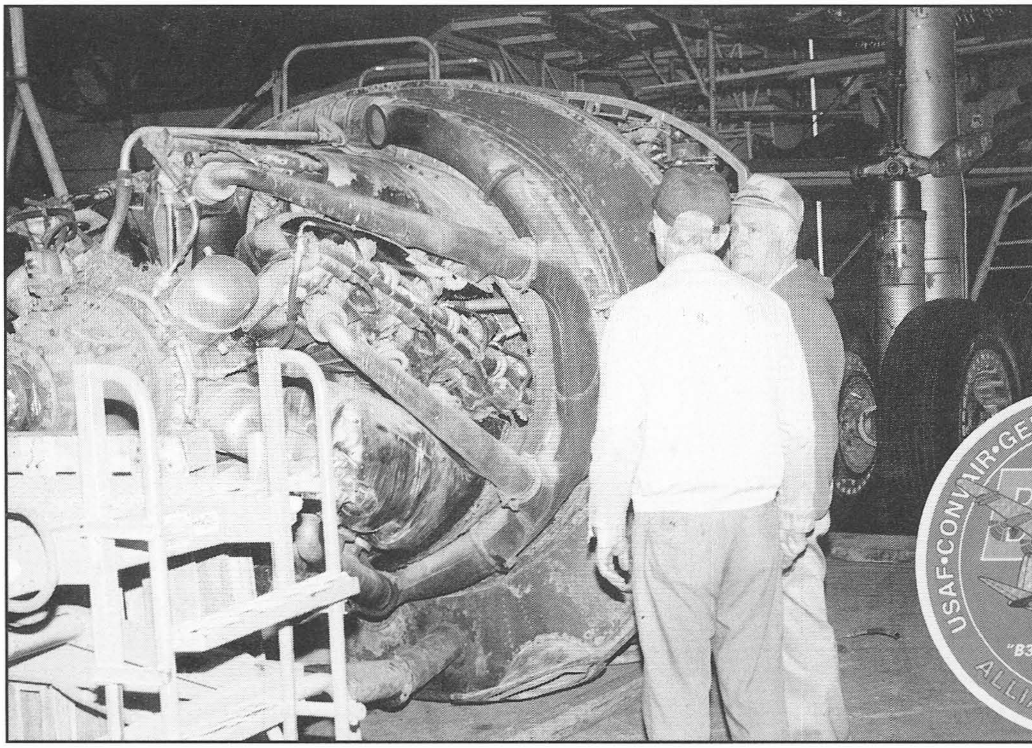
B-36H-15-CF 51-5710
Originally B-36H. EDB-36H in September 1952. JDB-36H in November 1955.

B-36H – TANBO 14 Refueling Tests

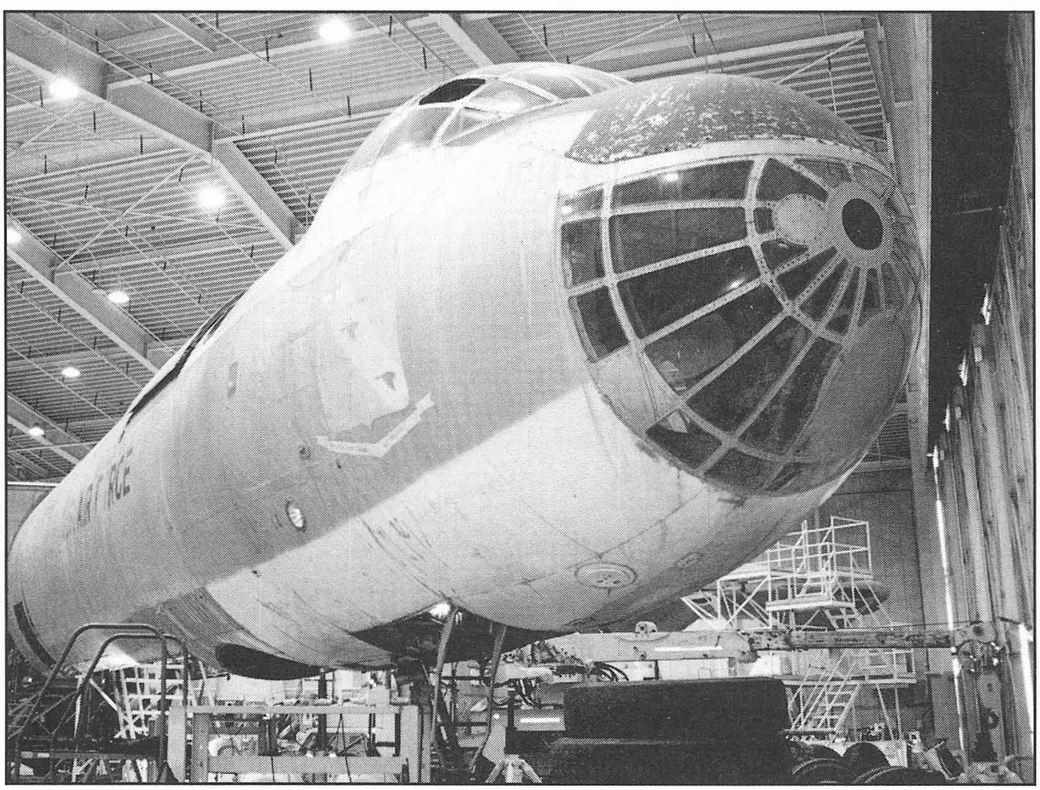
B-36H-15-CF 51-5706
Originally B-36H. DB-36H in January 1955. JDB-36H in February 1955. EDB-36H in August 1955. JDB-36H in November 1955.

RESTORATION

THE FORT WORTH B-36J-III



Restoration Director Bill Plumlee discussing a plan for the last remaining R-4360 engine. At one point in the 1970s, attempts had been made to fly the B-36J and major work had been accomplished on the engines. (Aviation Heritage Association via Don Pyeatt)



Front fuselage and main wing section following the separation of the aft fuselage. Although in need of major work, partially because of vandalism, the aircraft was remarkably complete externally. The B-36J had been completed on the assembly line as a Featherweight III aircraft and had not been equipped with defensive armament except the tail turret. (Aviation Heritage Association via Don Pyeatt)

The large rudder being removed from the vertical stabilizer. Note the empty holes for the tail turret and twin antenna units for the AN/APG-41A gun laying radar. (Aviation Heritage Association via Don Pyeatt)

Looking like new, the forward fuselage returns from Lockheed's paint shop. Many local companies have assisted with the restoration, including Lockheed Martin which purchased the Convair Division from General Dynamics in 1993. When the restoration is completed this B-36J will rival the aircraft in the Air Force Museum in appearance, a fitting tribute to the last B-36. (Aviation Heritage Association via Don Pyeatt)

The Aviation Heritage Museum has invested over 115,000 man-hours into the restoration of the last B-36 ever built. The museum estimates it will take another 50,000 hours to complete the B-36 once the museum building is finished, just to reassemble and finish it. Although the museum is receiving support from a variety of sources, including Lockheed Martin, which now owns the plant that built the B-36, more support is needed. Please write or visit the museum on the Web:

AVIATION HERITAGE MUSEUM – *Where History Spreads Its Wings.*
306 West Seventh Street, Suite 311, Fort Worth, Texas 76102
http://aviationheritagemuseum.com/ahmhome2.htm

SIGNIFICANT DATES

KEY DATES IN THE HISTORY OF THE B-36 "PEACEMAKER"

September 1939
Hitler conquers Poland in 20 days.

11 April 1941
Requests issued to Consolidated and Boeing for preliminary studies of an intercontinental bomber.

3 May 1941
Consolidated submits preliminary data on the Model 35.

15 November 1941
The Army Air Forces orders two XB-36s (W535-ac-22352).

20 July 1942
XB-36 mockup reviewed.

17 March 1943
Consolidated Aircraft merges with Vultee Aircraft, becoming Consolidated Vultee Aircraft (Convair).

23 July 1943
A letter of intent is issued for 100 production B-36s.

25 May 1945
The Army Air Forces cancels 17,000 aircraft – but not the B-36.

8 September 1945
The first XB-36 is rolled out.

8 August 1946
The XB-36 makes its first flight.

21 March 1946
The Strategic Air Command (SAC) is established by the Army Air Forces.

18 September 1947
The U.S. Air Force is established.

31 December 1942
A single XC-99 is ordered.

February 1945
Pan Am orders 15 Model 37 commercial versions of the XC-99.

24 January 1949
The XC-99 makes its first flight.

30 June 1948
A B-36A drops 72,000 pounds of bombs during a test flight. It's the heaviest bomb load yet carried by any bomber.

March 1949
A B-36B flies 9,600 miles in 43 hours and 37 minutes.

26 March 1949
The first jet-augmented B-36D makes its first flight.

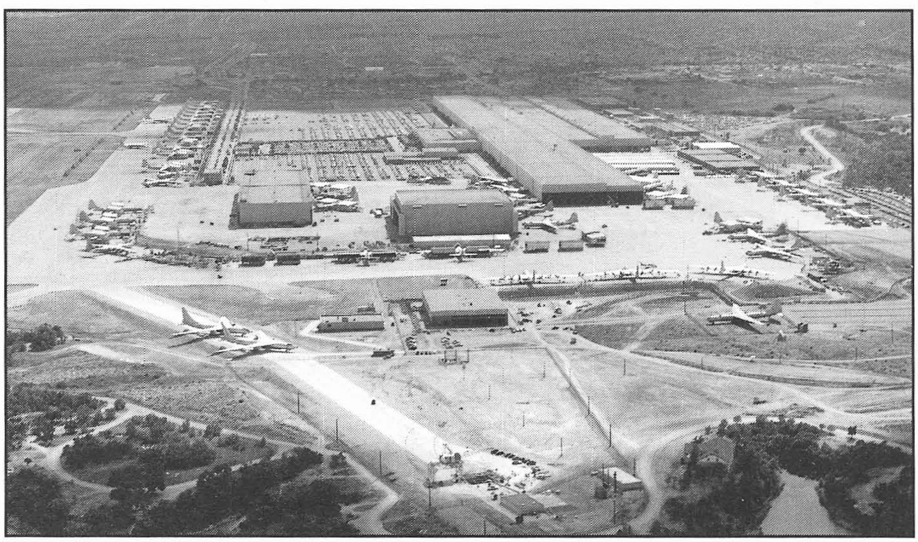
23 April 1949
Secretary of Defense Johnson cancels the USS *United States*, sparking almost open warfare between the Navy and Air Force over the fate of the B-36.

14 January 1951
An RB-36D makes the longest known B-36 flight – 51.5 hours – without refueling.

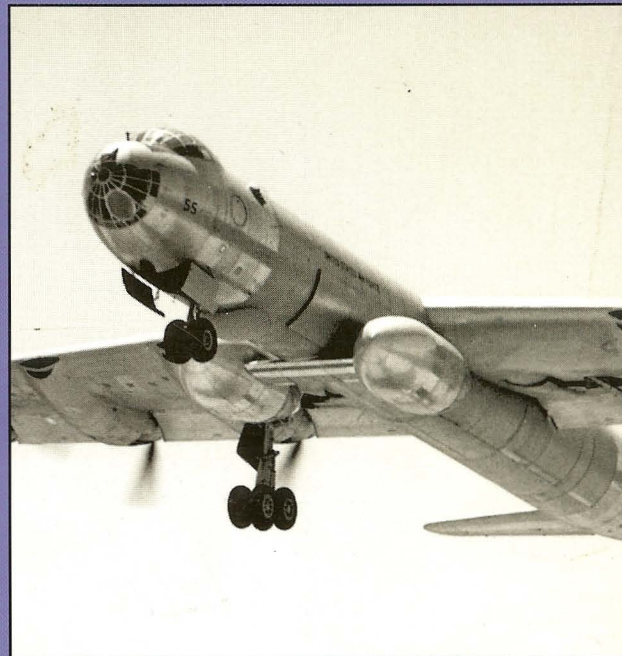
8 January 1952
FICON flight tests with a GRB-36F and F-84E begin.

14 August 1954
The last B-36J, a Featherweight III, is delivered to the Air Force.

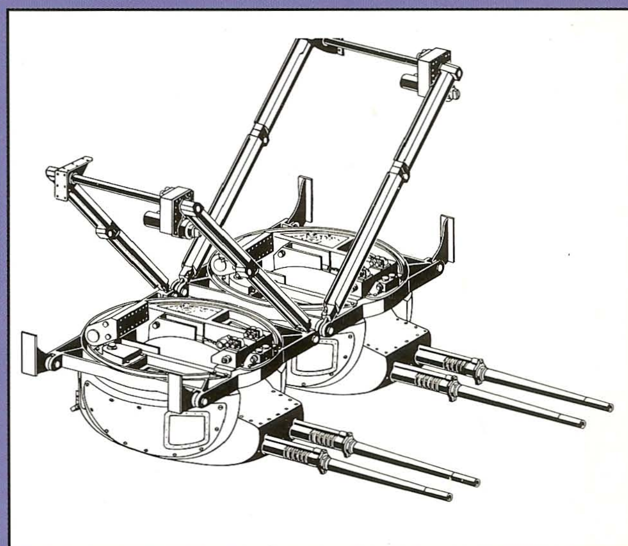
12 February 1959
The last B-36 is retired and SAC becomes an all-jet force.



The Convair Fort Worth plant. The Nuclear Area for the NB-36H program is at center in the foreground. The two YB-60s can be seen just west of the Nuclear Area. Note the #2 YB-60 is missing its rudder, removed to support the first aircraft. The XB-36 is at lower right in the open field. No fewer than 40 B-36s are around the factory buildings. (Convair via LMTAS/Mike Moore)



The B-36 served for only ten years, and there were always questions as to whether it could accomplish its assigned strategic bombardment mission. Nobody denied the aircraft was slow, although sometimes it was hard to ascertain just how slow it really was in comparison to other aircraft. But it flew so high that it probably did not really matter. Few fighters of its era could climb as high, and surface-to-air missiles were just being developed. It was not until the last few years of its service life that the B-36 was particularly vulnerable.



The aircraft also had very long legs, a necessary attribute for the first truly intercontinental bomber. It is hard to imagine a modern aircraft remaining airborne for two days without refueling, but it was not particularly unusual for the B-36 to do so. It took a long time to fly 10,000 miles at 250 mph.

Despite its seemingly obsolete appearance, the B-36 pushed 1950s state-of-the-art further than any other aircraft of its era.

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